September 1984
Vol. 10, No. 9
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Input/ Output

Sending for Help

Dear Editor:

Thank you for the excellent review of *TermExec*, our communications software package for the Apple in the June issue.

Just a few minor corrections: the Editor subsystem does indeed have a HELP command—just type ESC-?, the universal TermExec HELP request. Also, far from supporting auto-dialing only with the Hayes Smartmodem, TermExec supports all auto-answer and auto-dial features, touch-tone or pulse, with pauses, on all popular modems for the Apple, including the Hayes Smartmodem, the Micromodem II and IIe, the SSM, the Novation Applecat, and the new Apple Modem.

Patrick O'Neil
Chairman
Exec Software
201 Waltham St.
Lexington, MA 02173

Kudos, Boodos

Dear Editor:

I loved your piece in the March issue about the industry, although it was too short. More please. But next time, I hope you won't make such a hash of describing Kaypros. For example, all Kaypros have 9" monitors, not 7", the new IV is $1995, not $2195 (and includes a 300 baud built-in modem), and an 8088 board can be installed after the computer leaves the factory, but in this case cost is $800 instead of $400. Also, I understood that one of the Kays is father of the others.

"Inside Dreck" was hilarious, even to someone like me who really does read Dvorak first in *Infoworld*.

I'm a little tired of reading about how the PCjr is going to dominate the home market. Maybe, just maybe, so many people will read about how inferior the machine is (for the price) that sales won't meet expectations. Has there ever been a machine that sold solely or primarily because of the software available for it? Didn't people buy Apple IIs because they knew so many others who used it, not because so much software was available? Didn't people buy IBM PCs because of the name, not because so much software is available? *Now* these machines may be bought for software, but that was not the reason for their success initially. If people buy a machine to use PCjr software, won't they buy something made by Commodore or Atari that will undoubtedly be a much better value for price?

On the other hand, if it's really reputations and marketing that sell computers (such as the PCjr), and not the benefits of the machine, how is the Macintosh going to challenge the IBM PC? The Mac is a great toy, but it looks and "smells" so much like a toy that the businesspeople who bought IBM because it was IBM, will buy the next IBM rather than buy that toy Mac.

So make up your minds. Will the next wave of computer buyers buy for benefits, and consequently buy Mac (once it has enough memory and two drives for serious word processing) instead of PC, or will they buy reputation and buy IBMs. It can't go both ways, can it? If buyers of home computers are gullible (jr buyers), won't businesspeople be even more gullible? Perhaps I'm in the minority, but in my experience, individuals spending a lot of their own money are more careful buyers than are businessmen spending a lot of their company's money.

Dr. Lewis Pulsipher
5102 Catalpa Rd.
Fayetteville, NC 28304

If you read the Mac review in the July issue, your opinion of the Mac may have changed. It is all too easy to call it a toy, just because it is small and simple to use.—JJA

Spacing Out

Dear Editor:

The high point of the July issue for me was Part 3 of Arthur Luehrmann's excellent article on structured programming in Basic. I have a few comments which may be of interest to your readers.

It has always been a sin in my book to address a comment line with a GOTO or a GOSUB. When a program gets large, it may be wise to remove comments in the operating version while keeping comments in the master version. If the comments are addressed by GOSUBs and GOTOs and the comments are removed, obviously the program will not run. In my programming I put the comments in the lines ahead of the address as follows, using his last subroutine as an example:

```
597 '
598 ' SUB WRAP UP
599 '
600 IF G$ = S$ THEN 605
601     'FALSE
602         PRINT "YOU LOSE"
    Etc.
```

Lines 597 and 599 create separation spaces in the listing around the comment which calls the attention to the area when scanning the listing. In addition to adding to the "prettiness," nothing happens when the comments are removed.

In addition to planning the structure and the logic of the program, it is usually desirable to plan the variables to be used and to list them in the program. I begin the variable listing and initialization at line 64000 as a subroutine that is addressed at the start of the program. A listing could look like this:

```
63997 '
63998 ' VARIABLE LISTING
63999 '
64000 A$ = "CAT"
64005 B$ = "DOG"
64010 'G$       REPRESENTS PLAYER$ GUESS
64015 'S$       REPRESENTS SECRET WORD
64020 RETURN
```

I find that the variable listing is as valuable in understanding or modifying a program as the structure. In this listing, if the comments are removed, the initialized variables will remain in the program but the commented lines will disappear.

I hope that I can look forward to many more articles in *Creative Computing* of the quality of this series.

T.J. Anderson
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A Note To Our Readers

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SOFTWARE EVALUATION

Product evaluations in *Creative Computing* are different from those in many other magazines. Here's why.

A *Creative Computing* product evaluation is objective, thorough, and in-depth. Normally, we get an actual production product for testing—on loan or purchased from the manufacturer. We do not ask for or accept any special treatment, but interact with the manufacturer as a normal customer would.

In most cases, we test the product in the environment and under the conditions in which we would expect it to be used. We do not believe that we should sit in an ivory tower and pass judgment on a product that is meant to be used by a salesman on the road or a child in a classsroom.

When we evaluate a prototype, we state that fact in the review. Even so, we do not simply recite the manufacturer specifications; instead, we use the product, apply our own tests, and report on the results. If it lives up to the published specs, fine; if not, we tell you.

In our evaluations, we call a spade a spade and a lemon a lemon. Advertisers do not receive special treatment—no one does. Some manufacturers do not like this policy and refuse to work with us or advertise in the magazine. But most manufacturers welcome our policy of scrupulous honesty, and for that, we applaud them.

Nevertheless, we are not right all of the time. Sometimes, a unit might perform well in our tests, but be a dog for you. For that, we are sorry. But for the most part, we trust you will find our reviews—and the rest of the magazine—credible, honest, and interesting. ■

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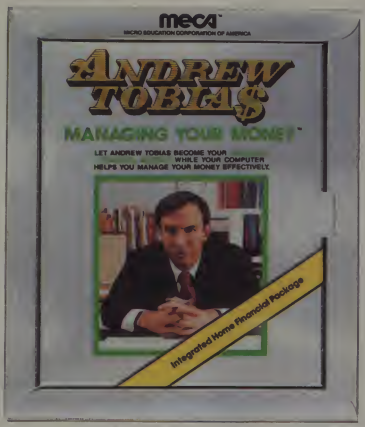

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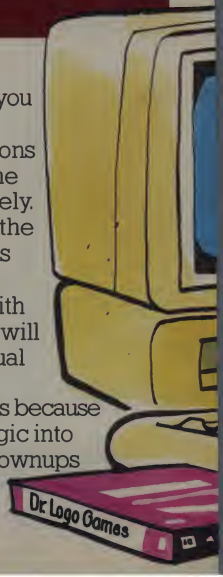

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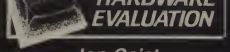
Sanyo 555
Small Business Computers

The Least Expensive of the PC Compatibles

Recently, Sanyo Business Systems introduced two new 16-bit microcomputers, the MBC-550 and the MBC-555. Many dealers are advertising these micros as cost effective IBM PC compatibles. More realistically, however, they should be viewed as machines intermediate in features between the PCjr and the PC, which can meet the needs of many users at a remarkably low price.

The MBC-550 package from Sanyo consists of a 16-bit, 8088-based, single board computer with 128K of RAM, a 5¼" disk drive, a keyboard with five function keys and a numeric keypad, color graphics capability, and a software package with Sanyo Basic, MS-DOS 1.25, *Easywriter*, *WordStar*, and *CalcStar*.



Jon Geist

The MBC 555 package includes an additional disk drive and *SpellStar*, *MailMerge*, and *InfoStar*. Some dealers, mostly mail order houses, are adding a monochrome monitor, printer, second disk drive for the 550, or some combination of the above to sweeten the deal. A second disk drive makes a 550 into a 555.

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SIX NEW HITS ARE COMING SOON TO A SCREEN NEAR YOU.

As this article is written, the 550 is selling for well under $1000 and the 555 for not much more. Clearly this represents a great deal of computer power for the dollar. One way to assess value of the 555 is to realize that a comparably equipped IBM PC costs about $3400. The 550 Series prices are so low for a 16-bit machine that they offer substantial savings compared to the most inexpensive of the PC compatibles, and even the PCjr.

Another way of looking at the value of the Sanyo MBC-550/555 is to realize that most comparably equipped systems based on 8-bit computers cost as much, and many cost even more. Moreover, the 8-bit systems are limited to 64K of RAM.

So the real question is this: What do you give up when you buy one of these computers instead of a comparably equipped IBM PC or PC compatible, and is the loss worth the monetary savings?

Compatibility

First, it is important to understand that the 550 Series is not fully compatible with the IBM PC. Probably the most important difference between the 550 Series and the PC is the way in which they address the memory map of the monitor screen. As a result, any software written for the PC that uses graphics or a screen editor probably will not run to its full potential as the 550/555. More about this later.

One weakness of the MBC-550 Series hardware as presently packaged is that it uses single sided disk drives, just as the IBM PC did when it was first introduced, rather than the double sided drives now standard with the PC. Thus, its disk capacity is only 160K of storage rather than the 320 available on the PC.

On the positive side, the Sanyo machine does use the same disk format that the PC uses for single sided disks, so it does read disks written on the PC as long as they were formatted using the single sided format option.

Essentially, the MBC-550 Series is data compatible with the IBM PC (like the TI Professional) rather than functionally compatible like the Eagle, Corona, Columbia, and Compaq. To see what limitations this might impose in any particular application, it is necessary to look at the computer itself, its keyboard, and its software in some detail.

The System Unit

The MBC-550 consists of a stamped steel chassis housing the single board computer, and a detached keyboard. The chassis is about 15" across by 14" deep by 4¾" high. This is a little larger than the PCjr chassis and about ¾ the size of the PC chassis in each dimension. It has a simulated stainless steel finish with a pleasantly functional appearance.

The front panel is plastic, but it matches the steel top panel perfectly. There we found an on/off switch, a TEAC FD-55A single sided, double density, 5¼" disk drive, and a compartment for disk storage. The compartment fills the space reserved for a second drive.

The fact that the system unit can accommodate two disk drives is a significant advantage over the PCjr, but the choice of single sided drives is a disadvantage. Obviously, there is some cost advantage to the single sided drives, and it is clear that Sanyo designed this system for high performance at low cost.

Drive A is on the right. This is unconventional by American practice, but causes no problems because each drive is identified by an embossed letter just below it. Next to the letter that identifies the drive is an icon of a small disk oriented properly for insertion into the drive. This should be a help to new and infrequent users.

The fact that the system unit can accommodate two disk drives is a significant advantage over the PCjr.

The chassis encloses the single circuit board. Hard wired onto this board is an 8088 processor, 128K of dynamic RAM, and the circuitry to control a parallel printer port, RS-232C serial port, joystick, composite video monitor, color graphics, and double or single sided disk drives.

The MBC-550/555 comes with the video monitor and parallel printer ports already wired to external connectors on the rear of the chassis. However, the connectors and cable for the joystick and serial port must be purchased separately.

The circuit board has sockets for 16 4164 dynamic RAM chips to expand the onboard memory to a maximum of 256K. A socket is also available for an 8087 numerical coprocessor, but no other expansion sockets are available within the 550/555 chassis.

There is a 62-pin connector on the circuit board with 48 of the 62 IBM PC I/O expansion lines connected to it. This is a good feature, allowing considerable expansion of the capabilities of the 550 Series through the addition of an external chassis to contain third party hardware originally developed for the IBM PC. But, this capability would have been enhanced considerably if some of the remaining 15 lines had been connected.

The missing lines are the -5 volt supply line, all lines involved in the memory refresh cycle, all lines involved in direct memory access (DMA), and all but one

HARDWARE PROFILE

Name: Sanyo 550/555
Type: Desktop business computer
CPU: 16-bit 8088
RAM: 128K expandable to 256K
Keyboard: Detached, 81 keys
Text resolution: 80 char. x 25 lines
Graphics: 640 x 240 pixels, 8 colors
Disk drive: 160K single sided
Ports: Centronics parallel, optional RS-232 serial
Operating System: MS-DOS
Software: Single drive system bundled with Basic, *EasyWriter, WordStar, CalcStar;* additional software with second drive
Documentation: User's Guide, manuals with each software package
Price: $999 (550, one drive) $1399 (555, two drives)

Summary: Least expensive IBM PC compatible machine; not fully compatible, but impressive list of software is already available. Sanyo appears committed to the market.

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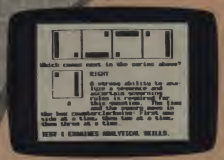

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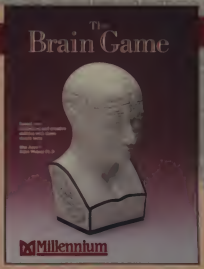

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of the user defined I/O interrupt lines. The absence of the -5 volt line is no great loss, but the loss of the other functions is significant.

Could the lack of those extra I/O functions be a reason not to buy a 550? If the computer is being purchased only to do the things that it already does, then I/O expansion capability is of little or no concern. Since even the most powerful 16-bit machines will probably be rather limited compared to the 32-bit machines that are planned for introduction over the next few years, this may be the most reasonable attitude toward expansion. But I assume that you are looking for a computer now, so if you want a computer that can grow in power and capability, you should be seriously concerned about differences in growth potential between the 550 Series and some of the more expensive machines.

Despite the limitations pointed out above, the 550 Series is capable of a great deal of external expansion. Thoughtworks in Phoenix, AZ already has 5, 10, and 20Mb hard disk drives for the MBC-550 Series that can be purchased at prices ranging from $2200 to $3600. Memory expansion cards for the PC that use static RAM should be easily interfaced to the 550/555, while cards using dynamic RAM would require a significant engineering effort because of the necessity to synchronize their refresh cycle with the internal clock of the computer.

Keyboard

The keyboard is a nice feature of the MBC-550 Series. It looks and feels more like an IBM Selectric keyboard than does the keyboard on the IBM PC, but still differs significantly from the Selectric layout around the edges. The DELETE key is in the right place with respect to the RETURN key, but the RETURN key, while conveniently large, is located one key far to the right. The keyboard is by no means quiet, but it is considerably less noisy than the PC keyboard. It also has a less metallic and squeaky sound.

The keyboard differs from the PC keyboard in several other more substantial ways. It has a hard reset key in a protected, but readily accessible location on the left side, and it has no ALT key as a true PC compatible would. Instead, it has a GRAPHICS key that works like a shift lock key. The first time it is struck, the keyboard enters the graphics mode and a red light on the key comes on to remind you that you are in the graphics mode. To exit this mode the key is struck again.

In the graphics mode the various key strokes, including shift-modified and control-modified strokes, are assigned alternate characters. All of the characters in the IBM extended ASCII set having decimal codes from 32 to 255 are available as keystrokes using either the normal or the graphics mode. Characters having ASCII codes 1 through 31 are not available as keystrokes, presumably because these ASCII codes are also assigned to control functions such as linefeed and carriage return.

Sanyo hardware has a good reputation for reliability.

In summary, the MBC-550 Series as delivered has more hardware capability in certain areas and less in others than a basic PC. Some of the expansion capability of the PC is already available for the 550 Series, and further expansions using hardware developed for the PC would be a rather simple job. Other expansions that are readily available for the PC, such as the production of a "smart" motherboard in an expansion chassis to implement functions not available from the 550 Series motherboard, would require a major engineering effort.

The 550 Series seems to be a more powerful computer than the PCjr, (except in the area of game support where the jr exceeds the PC itself). However, the jr can almost certainly run more PC software.

It is worth noting that Sanyo hardware has a good reputation for reliability. One of the local dealers in my area claims to have had fewer problems with Sanyo machines than with any other brand that he carries. Of the 200 8-bit and 60 550 Series computers that he has sold, only three have come back for hardware problems, and these were all easily fixed in his shop.

In closing this discussion of hardware and expansion capability, we point out that many PC's will never be expanded to equal the 555 as delivered. From this point of view, the 550 is a real bargain. In fact, when you consider the software that is included in the bundle, you might feel as if you were buying a keyboard, a color graphics board, a disk drive or two, and the software, and getting the actual computer for free.

Software Support

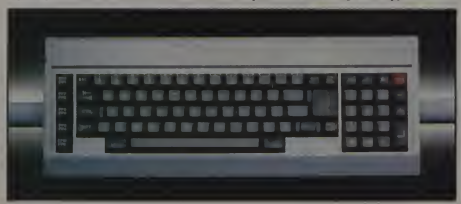
This brings us to the question of software. The MBC-550 Series may offer hardware power comparable to that offered by the PC compatibles, but it cannot be considered a comparable machine if there is a software package ideally suited to your task that runs on the PC, but is not available for the MBC-550.

Because the MBC-550 Series is very new, and because it is not functionally compatible with the IBM PC, there is not much software beyond what is bundled with it that will run on it at this time. Several companies are writing software specifically for the 550 Series, and Sanyo has released a list of 70 packages from about 20 companies that do run on the 550. Still there is a great deal of PC and generic MS-DOS software that doesn't run to its full potential because of problems with screen editors and graphics.

The software problem is currently more serious than it need be due to three more fundamental, but hopefully temporary, problems. The 550 Series Basic Input-Output System (BIOS) is not currently as PC compatible as it could be. There is little documentation currently available for 550 Series, and much of what is available leaves a great deal to be desired.

The BIOS, which is the source of some of the current software compatibility problems, is the machine language program that interfaces the CPU, memory, and all input and output devices. Thus the BIOS for each different type of machine must be different to reflect the details of machine hardware.

Software that uses a screen editor, such as a word processor, expects to be able to send control characters or



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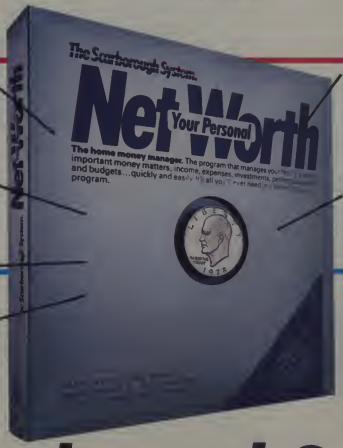

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characters following an escape character to tell the BIOS how to move the cursor, and whether to delete, overwrite, or insert. It is possible to write this sort of software using only the commands supported by the 500 Series BIOS, but generic MS-DOS software often expects the BIOS to support direct cursor addressing. This may not be a true system call supported by MS-DOS, so it may not be quite fair to expect this type of support. But finger pointing does not change the fact that this type of generic software is being written, and the 550 Series should run it.

Borland's new Turbo Pascal is an excellent example. The version of Turbo Pascal that is written for generic MS-DOS will compile and execute programs without any problems on the 550 Series, but its screen editor requires a richer variety of control commands than Sanyo has provided. Thus, one of the many outstanding features of Turbo Pascal, the convenience of a powerful, built-in screen editor, is lost by running the generic MS-DOS version of this language on the MBC-550. That's the bad news.

The good news is that the PC-DOS version runs perfectly on the MBC-550. But it is important to understand that this is not the case with all software written for the PC. The fancier the graphics and screen editing capabilities of a particular piece of software, the more likely it is that it will depend upon some feature of the PC hardware or BIOS that is not available on the MBC-550.

There are other deficiencies in the BIOS as well as the lack of direct cursor addressing. There is no interrupt for a screen dump, for example, which is a significant disadvantage, and there is only one video mode, which is a trade-off. The single video mode combines the text and high-resolution (eight colors, 640 x 200 pixels) graphics modes of the PC. This is a disadvantage in that it reduces compatibility with PC software, but it simplifies the use of graphics and other operations with software written specifically for the 550 Series.

The single video mode combines the text and high-resolution (eight colors, 640 x 200 pixels) graphics modes of the PC.

While it is true that the BIOS of the 550 handles software written specifically for it with no problems, the 550 Series would be considerably more powerful and would run more software better, if it had a better BIOS.

Bundled Software

Two word processing packages are bundled with the MBC-550/555, *WordStar*, Version 3.3 from MicroPro and *EasyWriter* Version 1.3 from Information Unlimited Software. Both work well, are well documented, and have well written training manuals.

IUS deserves special praise for their implementation of *Easywriter* on the 550. They took maximum advantage of the features of the 550 keyboard to create a word processor that is both easy to learn and easy to use. Readers familiar with earlier versions of *Easywriter* might be interested to know that version 1.30 has some enhancements that make it considerably more powerful and easier to use than earlier versions. But both the ease of use and the ease of learning are further improved by the way this word processor fits the keyboard. This sort of optimization is not possible with a program designed to work on several different machines.

There is not a great deal that I can say about anything other than *WordStar* and *SpellStar* in the software package from MicroPro. I have no real experience with spreadsheets, computer mailings, business form generation, and business data sorting, all of which are supported by this package. I have tried the various programs out to see how they work, and I have thought of few applications that I may have for them in the future. But I can't really comment intelligently on them, other than to say that they seem to work in the way expected.

Microsoft's MS-DOS 1.25, and the disk-based utilities, CHKDSK, COMMAND, DEBUG, DISKCOPY, EDLIN, FILCOM, and FORMAT are included in the bundled software package as the operating system. Chapter 4 of the Sanyo MBC-550 Series Operator's Guide, which is titled MS-DOS Introduction provides no help in using this operating system beyond the most basic operations. Not even the purpose of COMMAND, DEBUG, and FILCOM are mentioned in this chapter, much less their use. For some reason EDLIN and EXE2BIN (a utility that is not provided) are described in outline form. It is unlikely that anyone who did not already know how to use them, would ever guess what their use is, much less how to do anything useful with them based on the information provided. The last page of the Operator's Guide refers the interested user to Microsoft's MS-DOS Reference Manual for further information. One of the many texts on PC-DOS and MS-DOS might be even more useful, not to mention less expensive.

Sanyo's version of Microsoft Basic-80 with graphics commands is also part of the software package. Like IBM's BasicA and Microsoft's GW Basic, Sanyo Basic for the 550 Series was cross compiled for the 8088 from the 8-bit 8080 code for Basic-80. It even shares some bugs with the early versions of these other Basics. However, its graphics commands have somewhat different syntax, and it does not have as rich a set of commands. With very few exceptions the missing commands are not a serious loss. For instance, Sanyo Basic has a screen editor, but no line editor, and it has only one command (rather than the two redundant commands of BasicA) for opening ASCII files.

Chapter 3 of the Operator's Guide, which is titled Sanyo Basic, is no better than the chapter on MS-DOS. What is in this chapter is reasonably well de-

scribed. But most (or at least half) of Basic is missing. You will never find out how to read and write data to disk files in ASCII format, much less in random format from this chapter. You will never find out how to execute program overlays or to work with user defined print formats. Nor will you find out how to use PEEKs and POKEs or to write machine language subroutines. You will never even find out how to use most of the built-in functions.

This might not be a problem if the Sanyo MBC-550 Basic Reference Manual were available. But as of this writing, it has not yet been released. However, a Microsoft Basic-80 Reference Book or Reference Manual, and the List of Reserved Words in chapter 5 of the Operator's Guide, in conjunction with chapter 3 is more than adequate to enable you to use the full potential of Sanyo Basic. A manual for BasicA or GW Basic could also be used if you can find one to purchase.

In either case, it is advisable to modify the commands in the manual that you do use to reflect the differences between the version of Basic described in the manual and the version you are actually using. For instance, the DELETE option is not available in the CHAIN command in Sanyo Basic on the MBC-550 Series, but except for this omission, the CHAIN command works exactly as described in the Basic-80 Reference Manual.

The remaining four chapters of the Operator's Guide: Getting Started, Glossary, Technical Reference, and Peripheral Installations get mixed reviews. The first and last chapters are not bad. Both present the expected information in a concise, understandable manner accompanied by ample clear illustrations. A user with very little experience should have no trouble getting MS-DOS running and making back-up copies of all of the software supplied with the package following the step by step instructions in the first chapter.

The technical reference chapter is a mixed bag. More information would be desirable, but there is a great deal of useful information in this chapter. Unfortunately, it is not organized in any logical way, and much of it should be in other chapters. But, at least it is available somewhere. A description of how to install a screen editor to the extent that the BIOS will support it would have been a useful addition to this chapter.

The Glossary chapter is not very useful, being incomplete and, in places, incomprehensible. For instance, we find that a printed circuit board is "the real estate for electronic circuits. Sheets CIRCUIT BOARD [sic] of fiber glass or epoxy with copper conductors etched onto the surface. Components mount onto the traces," as well as more useful information that might help when reading other parts of the manual.

Conclusion

In summary, the MBC-550 is a very powerful computer for the money. In this regard, nothing else comes close. Whether all of its hardware power will be usable depends upon the quantity and quality of the software that becomes available for it. This, in turn, depends upon two factors: the number of people who actually buy this computer system and the amount of generic software and software written for other computers it can run.

The MBC-550 is no different from any new machine that is not a software compatible up-grade. Right now there is even less software available for the Macintosh than there is for the MBC-550. It will be interesting to see which machine is better supported in the long run. There is much more effort being devoted to the Macintosh, but that conversion is more difficult. All that is needed for the MBC-550 is a BIOS that provides better support for generic MS-DOS software. Of course, a BIOS that emulated the PC BIOS would be even better. However, because of the hardware differences between the two machines, this is probably not possible without a smart expansion box.

If the MBC-550 catches the public's imagination even without a broad software base, one will soon appear.

The only sure thing at this point is that if the MBC-550 catches the public's imagination even without a broad software base, one will soon appear. This, of course, applies to any new computer. If it does happen, a broad base of expansion hardware support will also appear, and in retrospect, it will be clear that the 550 was one of the best buys in the history of small computers.

On the other hand, buyers could just as easily find themselves with a system that is virtually without software and hardware support beyond what exists right now. If this is the case, the 550 may not look like such a good deal a few years hence, when the PC compatible machines are doing things that are just a gleam in the eye right now. Both of these scenarios are extreme, but they define the limits. In this field, no better predictions can be made.

In any event, if you are considering a computer purchase now, you owe it to yourself to consider the MBC-550 to see if it can do the things that you want to do now, and to see how much of a gamble is involved with respect to your goals for future expansion. You may want to take the gamble. If you are currently considering a system with a disk drive, it won't cost much more to go with the MBC-550 than with a Commodore 64, and the 550 is a much more powerful and versatile machine. ■

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HARDWARE EVALUATION

Russ Lockwood

Although new to the personal computer market, Monroe is no stranger to the business machine market. The company began operations back in 1912 with a single product, a mechanical calculator. At that time, the calculator was on the cutting edge of technology. Now, some 70 years later, Monroe is offering another state-of-the-art business machine—the System 2000 microcomputer.

The System 2000 consists of three components: a display, detachable keyboard, and system unit housing the cpu, disk drives, and the electronic innards of the system.

System Unit

The system unit looks sleek, in part because Monroe uses half-height disk drives. Despite its diminutive dimensions, a floppy drive holds a whopping 720K per disk under the MS-DOS operating system. The capacity declines to 640K under the CP/M-86 operating system. For those with larger storage requirements, an optional 10Mb hard disk drive is available.

While the floppy drive performed flawlessly, it sounded a bit raising clunk [illegible] noise when [illegible] accessed. We did not lose any data, unlike [illegible] with hard-sectored [illegible] sectoring is built into the [illegible] system, thankfully. The floppy drives use standard, [illegible] rather than keyed doors to lock disks in place.

However, the beauty of the System 2000 is more than skin deep. Besides its many colorful exterior [illegible] Motorola 16-bit 80186 microprocessor operating at 8 MHz. The 80186 is a development of the 8086, but is faster and more powerful. An optional Z80A co-processor is also available to run CP/M programs designed for 8-bit machines.

The System 2000 has five internal expansion slots, and Monroe sells memory boards, a Z80 processor board, and a RS-232/SDLC communications board. The base model comes with 128K of RAM and is expandable to 896K.

Standard ports include one parallel printer port and two RS-232C serial ports with programmable baud rates between 75 bps and 19,200 bps. Monroe sells a 300/1200 baud modem with autodial and auto-answer capabilities.

The System 2000 goes through a reassuring diagnostic self-test each time you power up the machine. A small system reset button is located on the rear panel among the various cables. The button is tough to find and awkward to reach, so if you are using MS-DOS, you are better off using Control-Alternate-Delete. The alternative is waiting 10 seconds between shutting the computer off and turning it back on.

Monroe thoughtfully included a clock/calendar, one of the handiest little extras you can find on a computer.

Keyboard

When it comes to describing keyboards, ergonomic is now an advertising buzzword. But, all hype aside, the System 2000 really does have a well-designed keyboard.

The detachable keyboard is connected to the system unit by a three-foot coiled cord. Monroe placed the connector in the front of the system unit, a thoughtful and helpful change from the usual practice of putting it at the back. Contrary to popular fears, the keyboard plug does not work itself loose and snap you in the nose.

The keyboard is as sleek as the system unit. It contains 92 keys arranged in four logical groupings. The 58-key QWERTY group is pretty much standard, although not an exact duplicate of a typewriter keyboard. Monroe thoughtfully placed the shift and return keys in their proper places and included an LED light on the Caps Lock key.

The cursor controls keys are arranged in a logical diamond pattern. However, the left and right keys could be larger. While one or two finger operation is fine, three fingers proves to be a bit crowded.

The numeric keypad also doubles as cursor control keys and includes special cursor keys Home, End, Page Up, and Page Down. The 0 and the decimal point double as the specialized editing keys insert and delete. The keypad has its own Enter key, and the Num Lock and Scroll Lock keys have LED indicators.

The last grouping places 10 user-programmable function keys and four application defined keys along the top of the keyboard. The 10 programmable

Cursor control keys are arranged in a logical diamond formation.

keys can actually do the work of 40 because they can be used with the Shift, Alternate, and Control keys.

Overall, the keys have a good feel, being neither too mushy nor too stiff. Aural feedback is good, although the lack of raised bumps on the J and F keys may prove disappointing to touch typists.

Display

The normal display supplied with the System 2000 is a 12" monochrome (amber) monitor. However, for $900 more, the computer can be equipped with a 14" color monitor capable of displaying 16 colors.

The monitor mounts on top of a pedestal that sits on top of the system unit. The pedestal is a good idea, one that should be standard equipment on personal computers. It allows you to tilt the monitor roughly 30 degrees upward and swivel it 180 degrees from side to side. This helps position the monitor for the most comfortable viewing angle, especially when more than one person is looking at the screen.

Character resolution of the display is 25 rows of 80 characters. The "IBM-compatible" character set consists of the standard 96 ASCII letters, numbers, and symbols, with an additional 140 foreign, mathematics, and graphics characters. Character display attributes include normal, underlined, high-intensity, blinking, non-display white, and non-display black in either normal or reverse video.

The display has a resolution of 640 pixels by 400 pixels using bit-mapped graphics. All the expected graphics statements and commands are implemented in Microsoft GW Basic, which is a refinement of Microsoft Basic for MS-DOS operating systems and includes special graphics and sound capabilities.

Instead of brightness and contrast knobs on the front of the monitor, Monroe chose a sliding switch mounted on the side of the monitor. This is not the cleverest of ideas because you cannot fine tune your video display with one switch as well as you can with two knobs. Futhermore, to get a comfortable

All the expected graphics statements and commands are implemented in Microsoft GW Basic.

HARDWARE PROFILE

Name: Monroe System 2000

Type: Small business computer

CPU: 16-bit 80186 8 MHz
(Optional 8-bit Z80A)

RAM: 128K (expandable to 896K)

Keyboard: Detachable, 92 keys

Display: 80 x 25 characters 640 x 400 pixels

Disk Drives: One or two 720K (MS-DOS) 5.25" floppy drives or one floppy drive and one 10Mb Winchester

Ports: Two RS-232C serial and one parallel printer

Dimensions:
System unit: 19.5" x 15.5" x 4.4"
Keyboard: 19.25" x 8" x 1.5"
Display: 13.5" x 12.75" x 12.25"

Operating System: MS-DOS CP/M-86 DPX

Documentation: User's guide and loose leaf manuals for each software package

Summary: State-of-the-art small business computer offers true 16-bit speed with 80186 microprocessor. Optional 8-bit Z80A coprocessor runs popular CP/M packages. Available software includes *WordStar*, *SuperCalc*, and *Condor* database.

Price: Base system 128K, one floppy drive, and amber monitor $3695; other configurations to $7225

Manufacturer:
Monroe Systems for Business
The American Rd.
Morris Plains, NJ 07950
(201) 993-2000

intensity level, we had to pull the switch almost all the way forward, leaving very little leeway for those operating in brightly lit offices.

Operating Systems

Monroe gives you a choice of operating systems for your System 2000. The first is the popular MS-DOS from Microsoft. MS-DOS is virtually identical to the PC-DOS (which Microsoft also wrote) that runs on the IBM PC. As you can imagine, with skyrocketing IBM PC and compatible sales, MS-DOS is well on its way to becoming the worldwide standard for 16-bit operating systems.

A distant second to MS-DOS in popularity, the other operating system bundled with the computer is CP/M-86 from Digital Research. Actually, the System 2000 uses a version called CP/M-86 DPX, but in general, it functions much the same as CP/M-86. Including MS-DOS and CP/M-86 with the System 2000 lets you run most of the 16-bit software available.

Presumably, for those unwilling to part with 8-bit software, or the cash to buy 16-bit software, the CP/M operating system should work with the optional Z80A co-processor board. We did not have a Z80A board and could not test this hypothesis.

Software

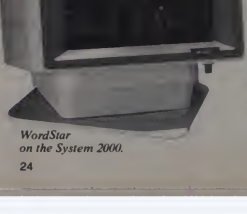
No matter how sleek the design or how advanced the hardware, if the computer does not have software to run, it becomes an expensive paperweight. Most manufacturers bundle a selection of business programs with their machines. Monroe does not, but several popular software packages have been converted to run on the System 2000.

The most popular computer application in offices is word processing, so Monroe offers the most popular word processing software package, *WordStar* from MicroPro. The version we had used the CP/M-86 DPX operating system and took quite a bit of effort to install. We started the installation procedure, received an error message, and got thrown out to the operating system. A quick call to Monroe solved the problem, and *WordStar* worked flawlessly, with fast overlays and rapid execution of commands.

Data base management systems (DBMS) are the rage for business computers, so the *Condor DBMS* is also available for the System 2000. Like *WordStar,* it uses the CP/M-86 DPX operating system, and also like *WordStar,* it gave us trouble in the exact same spot during the installation procedure. Fortunately, the same solution worked and *Condor* soared onto the screen.

Spreadsheets are also very popular packages, and Monroe offers *SuperCalc2* from Sorcim. Unlike *WordStar* and *Condor,* the spreadsheet runs under MS-DOS. Also unlike the other two packages, it worked on the first try. *SuperCalc* performed smoothly, calculating rows and columns rapidly.

Monroe claims an "ever-growing" selection of accounting, wholesaling, finance, health care, and other industry-specific software will become available for the System 2000.



WordStar on the System 2000.

Documentation

The manuals with the System 2000 are for the most part clear and thorough, especially the Guide to Operations. This illustrated introductory manual really holds your hand as it takes you through setting up and using the computer. How detailed is it? It goes as far as explaining how to insert floppy disks into the drive and how to pull them out.

The GW Basic and software specific manuals seem to be the standard guides issued by the manufacturers. Since the System 2000 does not have any specially marked keys, there was little need to rewrite the manuals.

All manuals are in three-ring looseleaf binders, making updates neat and easy to insert.

Pricing

Monroe offers 12 configurations of the System 2000.

The base model includes 128K RAM, one floppy drive, amber screen monitor, MS-DOS, and CP/M-86, and carries a suggested retail price of $3695. The same package with 256K costs $3925, and a color monitor instead of an amber one increases the price to $4825. Adding a second disk drive adds $600.

A System 2000 with 256K, amber monitor, one floppy drive, and a 10Mb hard disk drive costs $6095. The top of the line System 2000, with 256K, color monitor, one floppy drive, and one 10Mb hard disk drive, sells for $7225.

An add-on memory board with 128K costs $450; the Z80 co-processor board, $475; and the RS-232 communications board, $395.

Obviously, Monroe is not trying to secure a niche in the market by using price as its primary weapon. An equivalent IBM PC base system (128K, floppy drive, monochrome monitor) costs roughly $3000, about $700 less than the System 2000. Potential customers will make their purchasing decisions based on hardware and software features rather than price.

The Bottom Line

Are there enough of those features to attract buyers? Certainly. The System 2000 is aimed squarely at the business market, and it performs admirably. The heart of the computer, the 16-bit 80186 microprocessor, is fast—about 8 MHz fast—and this speeds up reformatting text in word processing and recalculating numbers in spreadsheets.

The most popular computer application in offices is word processing, so Monroe offers the most popular word processing software package.

Monroe includes the MS-DOS and CP/M-86 DPX operating systems, which means a great deal of business software can be converted to run on the System 2000. For those who want to develop their own software, the System 2000 supports GW Basic, Pascal, Fortran, Cobol, and C.

Monroe scores a great many points by paying attention to convenient little details—things like attaching the keyboard to the front of the system unit, putting the cursor keys in a diamond pattern, using a tilt pedestal for the monitor, and including a clock/calendar. The company did miss a detail or two, like the slide switch on the monitor, but the plusses outweigh the minuses.

The System 2000 is a small business computer that compares favorably with the competition. Advanced design, sleek styling, and the Monroe reputation point to success. Businesses considering purchasing a microcomputer would do well to consider the Monroe System 2000. ■

CIRCLE 401 ON READER SERVICE CARD

FAX.
WHO DISCOVERED AMERICA?*

Chances are, you got the answer right. But not all the questions in this computer version of the popular Exidy Arcade Quiz-game are so easy. Can you name the only bachelor to become the President of the United States? Or identify what the initials stand for in O. J. Simpson's name? (If you guessed "Orange Juice," you *won't* score any points.)

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One or two players, keyboard controlled.

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But the programs aren't hard to work. Many of the menus, commands and function keys are the same. So once you've learned one program, you're well on your way to mastering the rest.

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Personal Computer Software

CIRCLE 145 ON READER SERVICE CARD

Stearns
Desktop Computer

At first glance, the Stearns Desktop Computer seems no different from every other business desktop computer on the market. Like many other systems, it consists of three components: system unit, detachable keyboard, and display, and the advertising copy proclaims it is IBM-compatible.

HARDWARE EVALUATION

Russ Lockwood

So what else is new?

Plenty.

We get the feeling that Stearns examined the IBM PC, asked how it could be improved, and then went ahead and improved it. Best of all, Stearns did so at a price that can make a purchasing agent smile.

WE'VE ELIMINATED THE HARD CHOICE IN SOFTWARE PACKAGES.

The performance of a good software program is the reason you buy a computer in the first place. Now, which programs should you buy?

The price range and the capacity of the programs on the market vary all over the lot. Worse. Higher price does not necessarily mean better performance.

How do you make a choice?

You read the ads in your favorite computer publication, like this one, but many of them are harder to understand than the program manuals.

You talk to your friendly computer store salesman. It is human for him to present you with the program he is most familiar with or the program with the most profit for the dealer. Don't blame him. Just ask about MEGAHAUS QUALITY SOFTWARE and ask him to compare us to the competition.

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CIRCLE 158 ON READER SERVICE CARD

System Unit

Slim seems to be in for system units. More and more manufacturers are using half-height disk drives, which means the overall thickness of the system unit is decreasing. The Stearns Desktop Computer proves to be no exception, using half-height 320K 5.25" floppy disk drives.

The drives use the more efficient rotating knobs rather than a hinged door to lock the disk in place. Optional 5, 10, and 20 Mb Winchester disk drives are available.

Stearns includes a clever touch in the system unit. The system unit sits practically flush with the table as do most other desktop computers. However, a portion in the front of the system unit is slightly raised, leaving a storage space just big enough to tuck the keyboard out of sight. Hence, no more hunting for a place to put the keyboard down, or balancing it on top of the monitor when not in use.

The heart of the Stearn Desktop Computer is the 16-bit Intel 8086 microprocessor, a big brother to the 8088 (used in the IBM PC and clones). The 8086 and 8088 both use 16-bit internal architecture which provides 16-bit wide registers, data paths, ALU (arithmetic/logic unit), and instructions. The big difference between the two is that the 8088 uses an 8-bit external data bus interface while the 8086 uses a full 16-bit interface.

More and more manufacturers are using half-height disk drives.

This translates into speed. The 8086 zooms along at 8 MHz, while the 8088 operates at 4.77 MHz (IBM PC). In effect, the 8086 leaves the 8088 in the microdust. For additional number crunching, the 8087 Numeric Data Processor is supported.

The Desktop Computer has five internal expansion slots—four for optional Stearns expansion boards and one for IBM-compatible boards. However, you cannot just plug any IBM PC compatible board into that slot. The board must operate at 8 MHz rather that the usual 4.77 MHz, and these are far and few between. Stearns sells all the boards you will ever need, however, including 128K RAM and 256K RAM boards, a color graphics board, a Winchester drive controller, and a communications board.

Standard ports include one parallel printer port and one RS-232C serial port with programmable baud rates between 75 bps and 19,200 bps.

The Desktop Computer runs a short diagnostic self-test upon powering up. Stearns also thoughtfully included a built-in clock/calendar.

Keyboard

The detachable keyboard is connected to the system unit by a one-foot long coiled cord. Stearns placed the connector underneath the raised portion of the system unit on the back wall of this storage space. Unless you have teeny tiny hands or long ET fingers, you must lift the system unit to plug in or unplug the keyboard—a bit awkward, but if the computer usually stays on one desk, this presents no problem at all.

On the plus side, this also means that the keyboard connects to the front of the system unit, which is much better than bringing the cord all the way around from the rear. As an added bonus, the keyboard and its cord tuck away under the system unit which frees up desk space.

The keyboard is slim, compact, and extremely light. The edge of the keyboard, under the spacebar, slopes away, allowing you to place your wrists on the table. All in all, quite a comfortable arrangement.

The 94 keys are divided into five groups in a layout that is a bit different from other keyboards. The 55-key, full-stroke QWERTY group looks pretty much like a standard typewriter keyboard. The shift, return, and caps lock keys are in their proper places, and the caps lock key has an LED indicator. The major difference is that two extra wide control keys flank the spacebar. Touch typists will have no problem adapting to the keyboard.

The keyboard is slim, compact, and extremely light.

The second group consists of 10 programmable function keys located above the QWERTY keys. The third group, to the right of the QWERTY and function keys, is made up of seven special keys—insert, delete, alternate, print, function, program, and stop screen—all of which are self explanatory. The program key has an LED indicator and is used to program the 10 function keys.

Actually, when used with the control and alternate keys, these 10 programmable function keys do the work of 40. This especially handy feature speeds up using most programs, for example word processing or programming.

Unfortunately, the Desktop Computer does not include separate cursor keys. Instead, Stearns elected to make the 18-key numeric keypad double as cursor control keys, the same way IBM did.

The keypad has a Num Lock key with an LED indicator to tell you whether the numbers or cursor controls are ac-

HARDWARE PROFILE

Name: Stearns Desktop Computer
Type: Small business computer
CPU: 16-bit 8086 8 MHz
RAM: 128K (expandable to 896K)
Keyboard: Detachable, 94 keys
Display: 80 x 26 characters, 640 x 208 pixels
Disk Drives: One or two 320K 5.25" floppy drives or one floppy drive and one 20 Mb Winchester and up to two external drives
Ports: One RS-232 serial and one parallel
Dimensions: System unit: 22" x 15.75" x 5.5" Keyboard: 18" x 6.7" x 1.75" Display: 14.25" x 10" x 12"
Operating System: ST-DOS (PC-DOS emulation for 8086), MS-DOS 2.1, Concurrent CP/M-86, MP/M-86
Documentation: User's guide and loose leaf manuals for each software package
Summary: Solid small business computer developed specifically for networking with one to four other Stearns computers. Available software packages include *WordStar, Multiplan, dBase II*, and *Lotus 1-2-3*
Price: $2995 and up
Manufacturer:
Stearns Computer System
10901 Bren Rd. East
P.O. Box 9384
Minneapolis, MN 55440
(612) 936-2000

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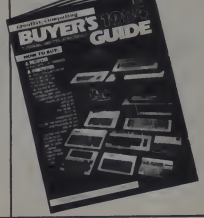

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Numeric keypad doubles as cursor control keys.

tive. Like most other manufacturers, Stearns places a subtraction, addition, and enter key on the side of the keypad. Unlike most other manufacturers, Stearns also thoughtfully included multiplication and division keys.

The last group consists of four special keys, each with an LED indicator, that are used for networking and communications.

Display

The Desktop Computer comes with a black-and-white monochrome monitor, although for a very reasonable $39 more, you can replace the black and white with a green, amber, or eggshell (softer white) screen monitor. Stearns also sells a color graphics kit, which includes a color graphics board and color monitor, should you desire more than a monochrome monitor.

No matter which one you choose, all monitors sit on top of a pedestal, which sits on top of the system unit. The pedestal has two side walls, each ending in a shallow U shape, that fit into two slots on the underside of the monitor. Unfortunately, the pedestal is only half as effective as it could be. Although you can tilt the monitor roughly 30 degrees vertically, you cannot swivel it. Of course, you can drag the pedestal and monitor across the top of the system unit, just as you would without the pedestal. Still, half a pedestal is better than none.

The monitor displays 26 lines of 80 characters. The Desktop Computer uses a "256-character IBM font" and supports an additional 256 user-defined characters. Display attributes include normal, reverse video, boldface, blinking, and underlining.

The Desktop Computer has a resolution of 640 x 208 pixels using bit-mapped graphics. Microsoft Basic provides all the commands necessary to produce color graphics. You can also use the GSX graphics option under the Concurrent CP/M-86 operating system.

Operating Systems

Stearns gives you many choices of operating systems. The first is the popular MS-DOS from Microsoft, the operating system used on the IBM PC and virtually all other 16-bit microcomputers. Note that the IBM PC has an 8088 microprocessor, and the Stearns Desktop Computer uses a 8086 microprocessor. Thus, while the majority of programs on the MS-DOS disk supplied with the machine will run on the Stearns, some will not. For instance, the versions of Basic and Advanced Basic on the supplied disk will not run on the Desktop Computer.

Stearns also includes ST-DOS, which emulates PC-DOS (Microsoft's version of MS-DOS for the IBM PC). This allows you to access programs developed for the IBM PC.

You can also run Concurrent CP/M-86 and MP/M-86, both of which are geared primarily for multi-tasking and networking. Concurrent CP/M-86 also comes with the GSX graphics option.

Software

We never criticize a machine for lack of software. After all, the IBM PC was released with only a bug-plagued word processing program, the venerable *VisiCalc*, and the Peachtree accounting software, and look at the plethora of programs available now.

Microsoft Basic provides all the commands necessary to produce color graphics.

Stearns knows this too, so the company made sure some of the most popular software programs were customized for the Desktop Computer. The five major business applications, word processing, spreadsheets, database management system, accounting, and communications, are all represented. Stearns does not bundle software packages with their system. You must buy them separately.

At the top of the list is *WordStar*, the

The Stearns Desktop Computer with dual floppy disk drives.

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CIRCLE 173 ON READER SERVICE CARD

best selling word processing program. We had some minor problems installing *WordStar* on the Desktop Computer. The culprit turned out to be a misnamed file. Once we straightened this out, the program performed flawlessly, and with the 8086 microprocessor, *WordStar* becomes a real speed demon. Commands from such simple procedures as page up and down to reformatting the text are carried out swiftly.

Spreadsheets are also popular, and you can use *Multiplan* from Microsoft. Once again, the speed of the 8086 microprocessor lets you recalculate rows and columns quickly. If you prefer a little graphics with your spreadsheet, *Lotus 1-2-3* is available for the Stearns Computer.

Database Management Systems (DBMS) are quite popular, so for general use, *dBase II* is available. For use in the medical and dental fields, Stearns offers the *Professional Data Base*. And accounting applications are taken care of with the *BOSS Accounting System*.

Stearns markets its own communications package for networking. They say you can connect up to five Desktop Computers quickly, easily, and without "high-priced connection equipment." But since we had only one Desktop Computer, we could not test the communications software or the installation claims.

Documentation

Overall, the documentation for the Stearns Desktop Computer is clear and thorough, and the introductory booklet to familiarize new owners with the machine is especially good.

The Basic and software specific manuals seem to be the standard guides issued by the manufacturers. Since the Desktop Computer does not have any special keys, there was really no need to rewrite the existing manuals. All documentation is in three-ring, loose-leaf binders, which make updates easy to insert.

Pricing

The Stearns Desktop Computer carries a very competitive price of $2995 for a base system with 128K RAM, two 5.25" floppy disk drives, and 12" black and white monochrome monitor. As we said before, substituting the green, amber, or eggshell monitor for the black and white monitor adds $39. The base system with a 10 Mb hard disk drive in place of one of the floppy drives costs $4995.

The color graphics kit, consisting of the color monitor and the color graphics board, costs $1595. However, if you purchase the kit with a computer, the cost is roughly $1000. Stearns sells 128K RAM expansion boards for $500, 256K RAM expansion boards for $700, and 512K RAM expansion boards for $1400.

A top-of-the-line Stearns Desktop Computer, with 896K RAM, one 5.25" floppy disk drive, one 20 Mb hard disk drive, and the color graphics kit sells for $9095.

For Me?

Obviously, we think the Stearns Desktop Computer is a dandy small business computer. It has a lot going for it—the 16-bit 8086 microprocessor, MS-DOS, and a wide variety of software packages. We are certainly impressed with the speed of the Desktop Computer. This is a real benefit when reformatting text, recalculating large spreadsheets, and sorting databases. If communicating with mainframes and other Stearns machines lives up to the advertising claims, the Desktop Computer turns from dandy to dynamite.

We like the thoughtful details Stearns built in to the machine: things like a storage space for the keyboard, disk drives with rotating knobs, a numeric keypad with multiplication and division keys, and multiple-use function keys. Stearns did miss a detail or two, like the pedestal support and hidden keyboard connector, but these minor faults detract little from the machine.

The Stearns Desktop Computer is not a run-of-the-mill business computer. It is fast, contains many features, and sports a competitive price. Business people and professionals thinking of purchasing computers for the office should consider the Stearns Desktop Computer. ■

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High Fidelity Display For Apple

Videx UltraTerm

Jerry Mar

After a long session on your Apple, when your aching eyes are vainly straining to focus the fuzzy letters on your screen, have you ever wished that screen displays were better—much better? Let me report that your prayers may have been answered.

Videx Incorporated's new UltraTerm video display card offers the most dramatic enhancement to the Apple video display yet. The high quality display modes in the UltraTerm enables Apple II and III users to view character displays that are truly "high fidelity for the eyes." Because the UltraTerm characters are formed with an 8 x 12 array of dots, they have three times more detail than the 5 x 7 dot array used in many other displays. This difference is illustrated in Figure 1, which compares the standard Apple IIe 80-column display with the same text on the UltraTerm using the high quality 80 x 24 display mode.

The UltraTerm also offers a plethora of highlighting options, including inverse video, intensified inverse video, and boldface. These same attributes can also be used for the normal display to generate additional display combinations. For example, mixing boldface for the normal display and normal inverse video for the highlighting is equivalent to reduced intensity inverse video highlighting.

Although the exceptional quality display of the UltraTerm is by itself a worthy accomplishment, the UltraTerm also provides expanded screen displays. In addition to displaying in the standard 80-column x 24-line mode, the UltraTerm can also display text in 96 x 24, 160 x 24, 80 x 32, 80 x 48, 132 x 24 and 128 x 32 modes.

For word processing and spreadsheet applications, the 80 x 32, 80 x 48 and 128 x 32 modes are wonderful additions. The 80 x 32 mode utilizes the same character set used in the high quality 80 x 24 display and can be used as a regular display mode while showing 50% more screen information.

Although less readable, the 80 x 48 mode is useful for reviewing text, since close to a full page can be displayed on a single screen. The 128 x 32 display mode allows wide tables to be directly viewed without using horizontal scrolling.

Installation and Use

But how easy is it to use? The installation of the UltraTerm card itself is very straightforward. In a normal installation the card is plugged into slot #3 of an Apple, with one card cable plugged into the video monitor and another into the Apple video output. The UltraTerm will also work if you have an Apple IIe and have an 80-column card in the auxiliary slot. Provided you preset the position of a small jumper plug (called the J1 Jumper) on the UltraTerm card to the IIe position, the regular Apple IIe 80-column display will be disabled but memory on that card can be used in the normal fashion.

Probably the most difficult UltraTerm installation requirement is the video monitor. A high frequency (at least '20 MHz bandwidth), high persistence monitor is needed to take advantage of the enhanced displays. Most monitors meet the first requirement, but few meet the

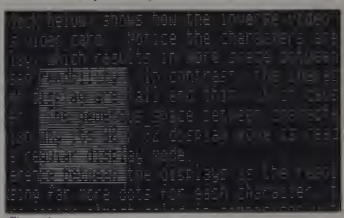


Figure 1a.

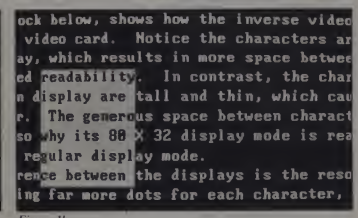

ock below, shows how the inverse video
video card. Notice the characters ar
ay, which results in more space betwee
ed readability. In contrast, the char
n display are tall and thin, which cau
r. The generous space between charact
so why its 80 X 32 display mode is rea
regular display mode.
rence between the displays is the reso
ing far more dots for each character,

Figure 1b.

Comparison of the video display, Figure 1a, from an Apple IIe 80-column card, and Figure 1b, the UltraTerm video display card. Both photographs were taken of identical magnifications on an Apple III monitor.

second. Suitable monitors include the Apple III monitor and Amdek 300A. Unfortunately, popular monitors like the Apple II monitor and NEC JB1201M do not work well with the UltraTerm.

Once installed, the UltraTerm card is invoked from Basic by typing PR#3 (assuming it is installed in slot #3). When the card is first invoked, the display mode is a "conventional quality" 80 x 24 display mode that emulates Videx's older VideoTerm product.

This mode can be switched to one of enhanced display modes by typing CTRL-V followed by a number from 2 to 8. The normal and highlighting attributes are set by following this with CTRL-W and two additional numbers.

The UltraTerm card also allows you to modify the cursor. The Applesoft sequence POKE 49328,10: POKE 49329,0 changes the default flashing cursor to a nonflashing cursor. These modes can be automatically set using a Basic program, such as HELLO.

But what about using the UltraTerm with commercial programs? Not all programs can make use of the enhanced display modes of the UltraTerm; however, there are many that can. Both the higher quality character sets and the expanded screen sizes can be used with *WordStar*. Videx offers a preboot program ($29) to enable the *Apple Writer II* and *IIe* programs to use three of the UltraTerm enhanced modes.

Videx also has a *VisiCalc* preboot program ($69) that adds four of the enhanced display modes to *VisiCalc*. Sorcim's *SuperCalc 2* CP/M program is able to make use of all the screen modes. Videx has also introduced their own spreadsheet program, called *UltraPlan* ($169), that can use all UltraTerm modes.

HARDWARE PROFILE

Name: UltraTerm Video Display Card

Type: Display peripheral, providing 80 x 24, 80 x 32, 80 x 48, 128 x 32, 132 x 24 and 160 x 24 display modes.

System: Apple II, II+, IIe, and III

Format: Plug-in card

Performance: Excellent

Documentation: Good

Price: $379

Summary: Card greatly enhances the text display of Apple computers, providing superbly readable text displays for word processing, as well as expanded size screen displays for spreadsheets.

Manufacturer:
Videx, Incorporated
897 NW Grant Ave.
Corvallis, OR 97330

Who Needs It?

Who needs the UltraTerm? Anyone using an Apple for extensive text work should consider the card; in my opinion it is the only card to use for word processing. After using one with an Apple IIe and *WordStar* for more than five months, I can say it is truly "a sight for sore eyes." My writing productivity has noticeably improved with the UltraTerm. I spot errors more quickly and I am less fatigued.

Not all programs can make use of the enhanced display modes of the UltraTerm; however, there are many that can.

For those upgrading an Apple II/II+ to 80-columns, the UltraTerm is a clear winner. It is priced only slightly more than other 80-column cards (list price: $379) and does almost everything better. For example, compared to Videx's own VideoTerm 80-column card, the UltraTerm duplicates all of the VideoTerm features while adding Applesoft cursor moves via the I, J, K and M keys and offers software switching between 80-column and graphics modes.

For owners of Apple IIe's, the tradeoffs are more complex. Although the UltraTerm card is a clear winner for word processing, it is *not* compatible with the Apple IIe 80-column card. Special Apple IIe features, like cursor movement with the vertical arrow keys, "upper-case restrict" entry mode, graphics mixed with 80-column text, and automatic graphics/text switching, are not available with the UltraTerm card.

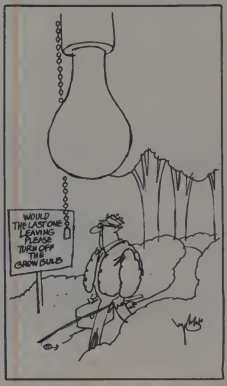
With Pascal, this means graphics can be viewed only by physically switching the monitor connection from the UltraTerm to the regular video output of the Apple—an awkward procedure, since the monitor must be reconnected to the UltraTerm to view text. Because of these differences, the UltraTerm will also not work with many commercial Apple IIe programs, including Apple's *Quick File II* program.

Fortunately, there is a way around these problems, if you are a little daring and already have an Apple IIe 80-column card in the auxiliary slot. The trick is to remove the jumper on the UltraTerm J1 jumper block, and replace it with a three-wire connection and a two-pole, single-throw toggle switch. The switch is wired so that the J1 jumper can be switched between the II/II+ and IIe positions from outside the computer.

The UltraTerm display and all its display benefits are invoked when the switch is in the IIe position. But if the Apple IIe is powered up with the switch in the II/II+ position, the UltraTerm is disabled and the Apple IIe 80-column display will appear on the monitor (even though the monitor is still connected to the UltraTerm). All standard Apple IIe 80-column features work in this mode. This arrangement offers the best of both worlds: 100% compatibility with Apple IIe 80-column software plus ultra high quality displays when needed.

In summary, the UltraTerm display card is a major display improvement for Apple computers. Provided you have a suitable video monitor, it is easily the best 80-column card available. Its biggest drawback is its lack of compatibility with 80-column Apple IIe software; but even that can be overcome if you are willing to make some simple hardware modifications. ■

CIRCLE 403 ON READER SERVICE CARD



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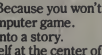

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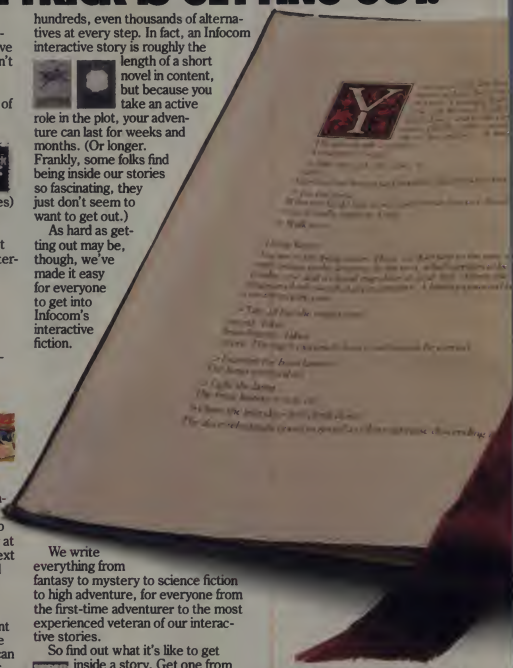

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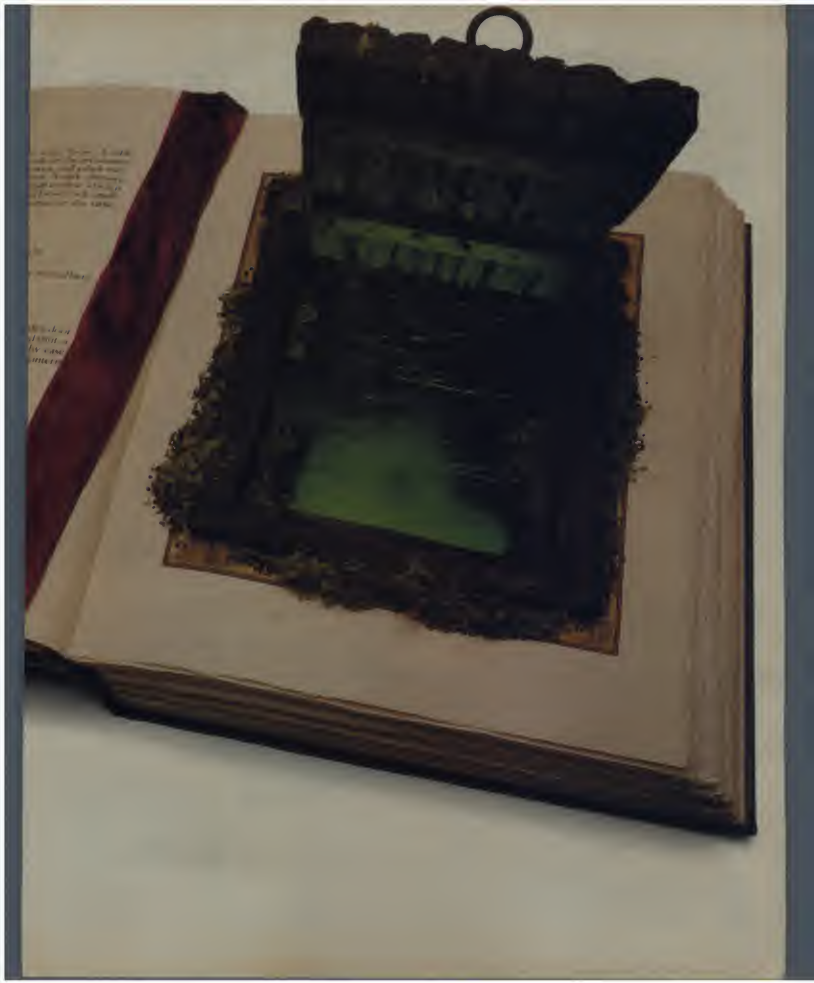

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Fast Facts: PFS Revisited?

Bill Jacobson

The PFS series of programs from Software Publishing Corporation is one of the major success stories of the microcomputer industry. The first PFS entry, *File,* permits computer neophytes to create customized database applications, *sans* the necessity of learning intricate programming languages, or more powerful but complicated database packages. The recipe for *File* and other members of the PFS family—*Report, Graph,* and *Write*—is a cup each of ease-of-use and flexibility, with just a smidgin of sophistication.

If long text field and word search capabilities are important, one of these programs may be your cup of tea.

Fast Facts from Innovative Software was designed to compete directly with *PFS:File. Fast Facts* is not a clone of *File,* even though the design philosophies of these programs are virtually identical. The proof of the program is in its special features. As you will see, *Fast Facts* offers an abundance of features that set it apart from its progenitor, *PFS.*

The Way It Works

Both *Fast Facts* and *PFS* are screen oriented file management programs. Routine data entry and search activities are accomplished with user defined data forms/screens. An example of a *Fast Facts* form is shown in Figure 1.

Unlike most database programs, *Fast Facts* defines forms and fields at the same time. Fields do not have fixed parameters. That is, you cannot restrict either the type of data entered (e.g., alphanumeric; numeric; date) or the length of a field to a specified number of characters. This means that special care must be taken during the data entry process to ensure the accuracy of the information being keyed in.

File managers like *Fast Facts* and *PFS* enjoy certain advantages over more conventional databases. Many programs are limited to 30 to 80 characters per field. With *Fast Facts* and *PFS,* however, an entire form can be one long text field, if you so desire. You also can search on any word or phrase, regardless of the number of forms in a record. Thus, if long text field and word search capabilities are important, one of these programs may be your cup of tea.

Form Design

Individual *Fast Facts* records can contain up to 50 forms, and each form up to 100 data fields (i.e., items of information). It is hard to imagine a record or form reaching the maximums allowable, so these limits are of little practical value. Normally, forms have no more than 10 to 30 fields, and records do not exceed two to three forms.

To start a new file, select the "Design a New Form" option on the Main Menu. After you name the file in which your new forms will reside, a blank design screen is displayed with various command options listed at the bottom. Move the flashing cursor to the spot for the first field and press function key F1 on the IBM PC. You can then enter a field name up to 20 characters.

This process sounds and is incredibly simple. Within a relatively short period of time, you have designed a custom file layout which can be used for data entry, access, and output. Editing of your creation is equally easy, using the commands noted on the screen.

To improve the appearance and readability of a form, you may draw divider lines on the screen, and sprinkle the screen with textual comments or identifiers. The form in Figure 1 uses this technique. For instance you can draw boxes around various titles or sections of data to make them stand out and be easily identifiable. The use of such a feature is purely a matter of taste. However, an attractively designed, easy to read form can relieve some of the tedium of data entry and search activities, and in so doing may decrease the potential for data entry errors.

Data Entry/Search

Once you have completed the design, you press E (Enter, Search, or Display) on the Main Menu and begin data entry. Data on each form may be printed, with or without field names.

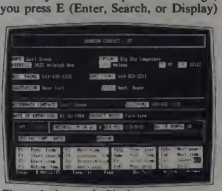

Figure 1. A sample file form.

If your data entry needs exceed the limits of a form design, you may press the specified function key and create one or more additional pages. These are totally blank pages in which you can enter any text desired. This means each form is, in essence, open ended, and as much information as needed may be stored.

A very useful feature is the calculator function. You can add, subtract, multiply, or divide data in equations of up to 254 characters, and enter the results of

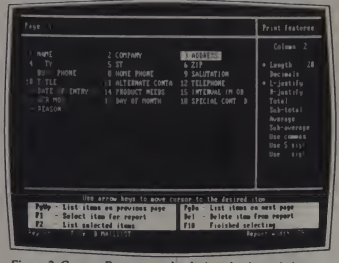

Figure 2. Custom Reports can be designed using existing fields with options from right column.

Item	File/Report	Fast Facts
Records per file	Unlimited	1500
Forms per record	32	50
Fields per form	100	100
Calculator function	No	Yes
Menu/help screens	Few	Many
Data erasure prevention	Poor	Good
DIF interface	No	Yes
Reads/writes ASCII files	No	Yes
Reports		
Max columns	16	20
lines per record	1	Many
Format options	Few	Many
Title lines	1	4
Mailing labels		
Max across page	1	4
Format options	Few	Many
On-screen set up	No	Yes
Disk drives required	1	2
RAM required	64K	128K
Price	$265	$195

Table I. Comparison of PFS File/Report with Fast Facts.

the calculation into any data field on the form. This function is important, because neither *PFS* nor *Fast Facts* permits computed fields, in which the values of two or more fields on a form can be used to automatically compute the value of a results field.

Data search is also conducted in this mode. Search conditions can be entered for any field listed on any form, and such searches may be literal (exactly as entered) or wildcard.

The data entry and search functions work beautifully. I did not test search speed with a large file, but the program has a crispness of execution that portends a quick overall response time.

SOFTWARE PROFILE

Name: Fast Facts

Type: Database

System: IBM PC/XT and compatibles

Format: Disk

Performance: Very Good

Ease of Use: Excellent

Documentation: Very Good

Summary: General purpose database program that is ideal for those who treasure flexibility and simplicity above all else. Limited to 1500 records per file.

Price: $195

Manufacturer:
Innovative Software
9300 W. 110th St., Suite 380
Overland Park, KS 66210
(913) 383-1089

Report Generation

Three types of structured output are possible: quick print, custom reports, and mailing lists.

The Quick Print function prints 12 characters from each of the first five fields of every record. Only those fields on form one are shown. Its features cannot be modified. Quick Print enables you to scan all records in the file on a one line per record basis, rather than having to display entire forms. Output can be to screen or printer. This is a useful feature if you want a quick fix on what records are in a file, or a relatively short reference list for more detailed data searches.

With the Custom Report option, you can design columnar reports containing up to 20 existing fields, plus computed fields. Numeric columns can be subtotaled, totaled, subaveraged, and averaged. In addition, there are several numeric format options, including commas to set off thousands (e.g. 1,000,000); dollar signs to the left of an entry ($121) or percent signs at the right of a number (23%).

The screen for designing a custom report is shown in Figure 2. Fields are displayed one formful at a time, but you may page back and forth. Fields can be selected from any form and in any order. Once a selection has been made, you can change the column heading for the field (from that used for the data form) or data display conditions, using the criteria listed on the righthand side of Figure 2.

After field selection is complete, you can create computed columns using any numeric fields included in the report specification.

The Custom Report function works well, but there are some annoyances. For example, complex record retrieval specifications cannot be saved. They must be re-entered each time a report is run—a rather cumbersome procedure.

In addition, the fields used for creating a computed column must be included in the report, even though they may not be relevant and take up valuable space. For example, any fields used in the equation Price x Quantity x Discount must be included as columns in a report to produce the computed column Total. It is preferable to permit non printing fields in a report specification. These fields can then be referenced when you define a computed column like Total.

The data entry and search functions work beautifully.

The Mailing Label function works extremely well. Two of the design screens for this feature are shown as Figures 3 and 4. I experienced no problems in designing several different formats. Because labels can be 10 lines by 60 columns in size, they may be used for an enormous variety of jobs, such as index cards and monthly billings. This is one of the most versatile label functions I have ever used.

Data Interchange

Fast Facts can create a DIF file of records that can be read by *Lotus 1-2-3*, *Visicalc*, or any other program with DIF capabilities. In addition, *Fast Facts* can write comma delimited data to a stan-

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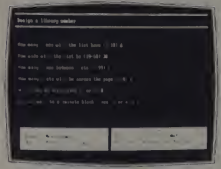

Figure 3. Mailing Label options.

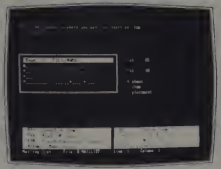

Figure 4. Mailing Label design.

dard ASCII text file, so that it can be read by *WordStar*, *dBase II*, *Supercalc*, and many other programs. Conversely, ASCII files prepared by such programs also can be read by *Fast Facts*. These utilities work extremely well.

Ease of Use and Documentation

A hallmark of this type of program is ease of use, and *Fact Facts* lives up to its billing. You can move quickly from file design to data entry to report design to report generation, etc. Help is provided every step of the way, and the necessary commands are listed on each screen.

The well organized manual is contained in a tabbed loose leaf binder, and the tutorials and other materials in it are easy to use. Innovative Software opted for less rather than more verbiage, under the premise that a combination of limited text and liberal use of simulated program screens might communicate better. I think they were correct in this judgment.

The manual is not indexed, a feature I normally demand of any computer documentation. An index is still desirable, although less so with a program as transparent as *Fast Facts*.

Fast Facts vs. PFS

Table 1 compares the major features of *Fast Facts* and *PFS*. The former includes a report writer, which is an extra cost option with *PFS*. The report generation options of *File* are very limited. Thus I elected to compare *Fast Facts* with the tandem of *File* and *Report*, in order to judge the full capabilities of our contestants to input, store, access, and output data.

PFS permits many more records per file, but otherwise does not have the flexibility, speed, and features of *Fast Facts*.

Summary

Fast Facts should please anyone who needs a text oriented database program that is easy to use and extremely flexible. It will not take the place of *dBase II* and similar programs, which have incredible power and the capacity to handle large data files. If your needs are not that extravagant, *Fast Facts* may satisfy you without the bother, expense, and frustrations of learning and using a complex program.

I rate *Fast Facts* much higher than its chief competition, *PFS:File* and *Report*. The basic design of both programs is similar, but *Fast Facts* can do more things, with greater flourish than the *PFS* tandem, and it costs less. ■

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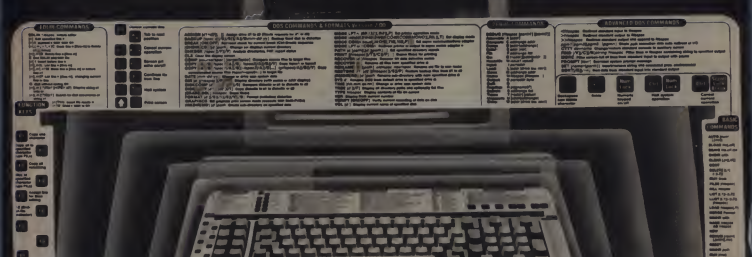

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Choosing & Using a Data Base Management Program

What Is a Data Base Package?

How to Buy a Data Base Management System

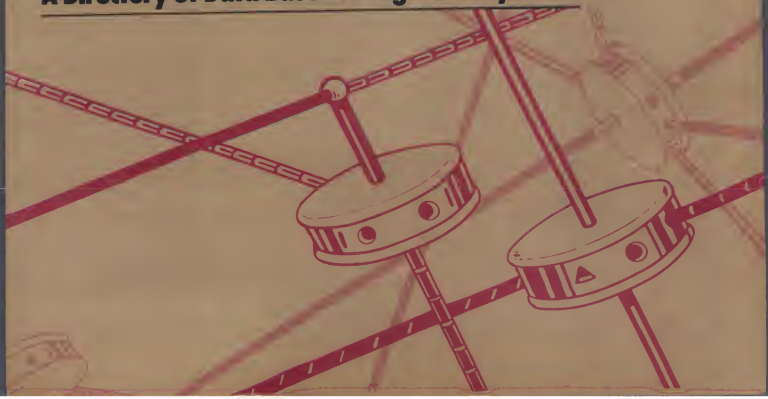
Types of Data Bases

A Lexicon of Data Base Terms

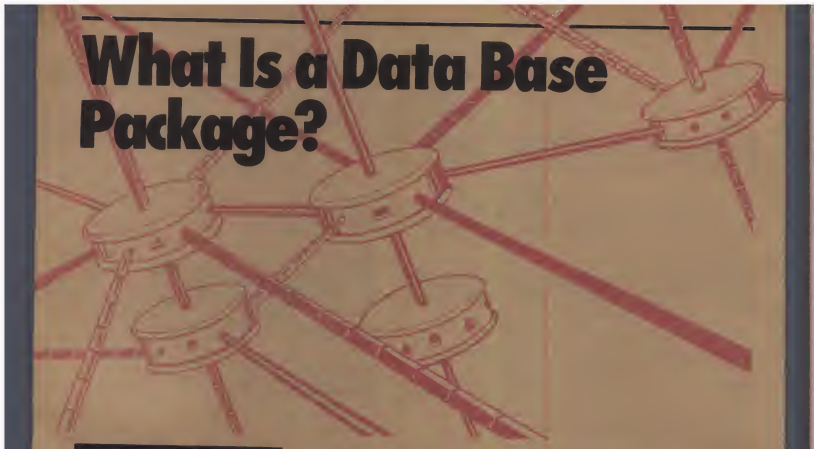
Data Base Paraphernalia

Data Base Comparison Chart

A Directory of Data Base Management Systems



What Is a Data Base Package?



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If you have a checking account and a card file of favorite recipes, you already have two data bases. They are organized collections of important information, which are used regularly and may give you enormous headaches if not properly updated and maintained. Many of us have rued the day we failed to keep our checking account in balance and were greeted with nasty notes from the bank and our creditors, or did not correct a mistake in an old family recipe and were forced to serve fried Spam to important guests.

Computers can help you with these and many other collections of information, by making them easier to maintain and much more accessible. This is accomplished with data base programs that tell the computer how to accept (input) information entered from its keyboard or another device, and to present (output) these data to a monitor screen, disk storage unit, printer, or other medium.

Data can be sorted and printed out in the order you specify, at the touch of a few keys. You can easily generate summaries of how you spent your money—food, doctors, mortgage, car expenses, etc.—from your computerized checking account, or a shopping list of ingredients needed for next week's meals from your recipe data base. All of this is accomplished without having to wade through reams of paper each time you dream up a new way to organize or report on the information you have collected.

The larger and more complex a collection, the more a computer can help. A business that maintains many different types of accounts has a much bigger potential headache than most of us have with just one personal checking account. Most businesses have hundreds of customers and handle thousands of transactions (sales, returns, purchases) a month. Income and payments (cash flow) must be estimated with precision so that checks to employees, suppliers, the landlord, the bank, and others can be covered, and the company can take advantage of cash discounts offered by suppliers for prompt payment of bills. When a massive parts inventory must also be controlled, the potential complications become mind boggling.

While an infinite number of monkeys, equipped with infinite numbers of abacuses, ledgers, and quill pens could accomplish these tasks, matters of this type are best left to the computer marvels which now inhabit so many homes and businesses.

The software programs required to communicate your needs to a computer can be developed from scratch, using Basic, Cobol, Pascal, or any other high level programming language. This could involve a great deal of work, however. A fair size accounting system, for example, can take a skilled programmer months to prepare, test, and de-bug, and much more time to modify if your needs change dramatically.

Many private individuals and businesses opt for data base management programs that are faster and easier (ergo more cost effective) to set up, and may not require much expertise to master. These programs are application generators. That is, you tell the computer (via the keyboard) what you want it to do, using relatively simple and understandable commands, and these instructions are automatically translated by the program into a language understood by the computer. This can greatly simplify the preparation of complex data bases.

Some programs are very user-friendly, with menus and tutorials to direct your every step and on-screen help messages at your beck and call. Others are less friendly, but may compensate for their comparative complexity by offering more flexibility and versatility.

There are two basic types of data base packages: specific purpose and general application. The former are best exemplified by accounting modules—ledger, payroll, inventory, and other components—that can be used only for the purpose for which they are designed. While specific purpose programs can be implemented immediately and do not require an extended program development period, they are static in design. What you see is what you get. They can be neither improved by you nor customized to suit special conditions or needs.

The general application software discussed in this article, on the other

hand, lets you determine the purpose and design of your data base, including the type, length, definition, and other characteristics of data to be entered, and the layout of reports.

All data base programs are not created equal. In the next section we will discuss the options available to you, so that you can make an educated choice of the type of program that best suits your specific needs. Regardless of which program you use, the quality of your efforts will depend upon the time and care that goes into data base design and preparation. It is not uncommon for many data entry items in a poorly designed data base to be incomplete or empty; data needed for these items may be unavailable, of suspect quality, or too difficult to obtain routinely. Wishful thinking should not replace sound judgment.

After data entry items have been defined, you should gather and enter all necessary information and verify that it

There are two basic types of data base packages: specific purpose and general application.

was properly entered with a discipline and rigor that borders on fanaticism. Inaccurate data files are of little value. A cake recipe that leaves out sugar or incorrectly calls for a tablespoon of salt rather than a teaspoon is a portent of disaster. As is a checking account that appears to be out of balance by $20 in your favor, when a trial balance might verify that you made a serious error and are actually $200 in the hole. It is a waste of time to set up a data base unless you are willing to expend time and effort to keep it accurate and up-to-date. This is especially critical in business, where good data is the life blood of a vital operation.

If you select your data base software wisely, follow a few simple rules, and apply real discipline to your data gathering, entry, and verification activities, you will be amply rewarded. Your computerized data files will provide the information you need in the format required and with an appropriate level of data integrity. ■

How to Buy a Data Base Management System

Database programs are not magical in concept or origin. Despite grandiose claims in many advertisements, the "one and only" data base does not, and may never, exist. Nonetheless, software improvements historically have lagged well behind hardware breakthroughs, so some very good ones may be in the offing. But don't count on that happening.

To further complicate the situation, some software companies are using the gambit of advertising their wares well in advance of a release date, just to get unwary buyers to hold off purchasing software from a competitor. One such company, which will remain nameless, has been advertising a comprehensive, multicomponent package for what seems like years. The release of this product was many months behind schedule. The version that finally reached dealer shelves is flawed, I am told, and requires major redesign to make it competitive. The homely but apt saying about a "bird in the hand" certainly applies to the purchase of computer software.

Even a well designed new product may experience growing pains before major problems are discovered and corrected. These problems are called "bugs" in that special branch of entomology known as computer programming. This does not mean that experimentation with the new and exciting is taboo. Just do not expect adult behavior from the newborn. Be willing to tolerate some, but hopefully not many faults, and do not take advertised claims literally.

The choice you make undoubtedly will be a compromise. You may want the power of an extremely versatile package like *dBase II* (or *III*, if you own a 16-bit machine), but yearn for the friendliness of *PFS:File* or *Data Base Manager II*. In addition, you may demand that your database execute any and all commands instantly. Unless you own an Altos 586 "super micro" computer, however, that desire may never come to fruition. Also, it would be nice if you could print out incredibly intricate reports on the head of a pin, and so on, and so forth. The wish list sometimes seems endless, and the realization of what is possible so frustrating.

This article does not promise an easy path to data base nirvana. Nor does it stipulate that you retire to a Himalayan aerie for a year of contemplation before making a decision. What is absolutely essential in this process, however, is a realistic look at your needs and desires. What do you really want your computer to do?

We will explore the key features of good data base programs and briefly describe a sampling of the current breed. The programs selected for this sampling are representative of certain classes of ca-

How to Buy a Data Base Management System

pabilities. There may be others of equal merit within each classification, and we apologize in advance for any inadvertent oversights.

One term of comparison that you will not see in this article is "best value." This is a nebulous term that defies concise definition. If a program does what you want but costs $200 more than a less capable one supposedly rated much higher, buy it. The difference in cost is meaningless. The biggest expenses of a data system are related to people and time, not software (i.e., the cost of setting up, maintaining, and updating a viable data base).

For example, one software rating service recently attempted to compare *PFS:File* with *dBase II*. As you will see, this is a ridiculous comparison. *PFS* is one of the least sophisticated programs available, and *dBase* among the most versatile and powerful. They are two entirely different classes of programs. Hopefully, we have avoided this type of "apples and oranges" comparison in our synopses by dividing the various programs into more representative pigeonholes.

At best, our efforts will provide you with a smattering of ideas on what constitutes good data base management, and may point you in the direction of software that tickles your fancy. The real test will come with hands-on experience. With the current proliferation of software stores, it should not be difficult to locate one that has what you are looking for and will offer you time and a machine on which to try it out. It may be more difficult to find a salesman who is familiar with the program of choice.

Useful information can be obtained from people who have written applications with a package, but be cautious about such advice. Users sometimes become true believers and have been known to deify "their" programs. A dealer may be able to direct you to an experienced user with a more objective view of the world.

Local user groups are also excellent sources of good information, with the reservations noted above. Some of the more popular programs like *dBase II* even have their own software groups. Failing that, hardware groups usually have lists of people who know their software well, may be willing to spend time with you, and are a continuing source of wisdom when you reach a roadblock. The Apple users group in the Washington, DC area (Washington Apple Pi) is an excellent example of this type of organization. Some even offer low cost training for the most popular programs.

Finally, much has been written on data base programs in periodicals and paperback books. We have included a list of the latter at the end of this article. If you are a casual user of data base programs, and your demands are not out of the ordinary, extensive reading in this area will be of little value. If you are more ambitious, it may be worth your time to skim through, if not study a few of these. Much of the material covered in these works is beyond the scope of our discussion here. ■

More Programs, Other Machines

AFTER READING THIS special section on Choosing and Using a Data Base Management Program, you may well decide that you don't need all the features that even the simplest of the programs covered offers. Or you may feel that, while the extra features might be nice to have, you are unwilling to pay for them. Or you may own a Commodore, Atari, or other machine not covered in our chart.

Don't despair. There are many less extensive (not to mention less expensive) packages that may meet your needs. We simply ran out of room, and had to draw the line somewhere. We will try to include a roundup of data base and file management packages for the home and other less sophisticated applications in the near future.

In the meantime, if you fall into one of the categories mentioned above, we recommend that you check out the offerings of Scarborough Systems, Precision Software, XOR, Handic, Commodore, or any of several dozen other manufacturers of capable, multi-purpose data managers. □

Types of Data Bases

The two most popular types of general application programs are file managers and relational data base systems, both of which are discussed in this article. The main difference between a file manager and a relational program is the capacity to use information (for reports, queries, updates) from more than one file concurrently. File managers can support many separate files, but only one of these files can be accessed (open) at a time—i.e., if you are using one checking account file, you must leave (close) it before you can use (open) another checking account or any other file. Relational data bases, on the other hand, can access data from two or more files at once. This capability varies widely among such programs, with the extremes being two files for *dBase II* and an "unlimited" number for *DataEase*.

Question: Who needs a relational capability?

Answer: The classic example is a business with separate customer, parts, and orders data files. You can automatically add customer and parts information to an order, would you believe, by setting up a "relationship" between the orders, parts, and customer files. To do this, a common bond must exist between them.

For example, you can enter a unique customer number on an order form, and name, address, and other information from the appropriate record in the customer file will be inserted on the form. Likewise, enter the desired parts numbers on your order form, and price, description, and availability information also will be inserted in the order.

This is called an interactive "look-up" function. Not only does this capability make it easier and faster to fill out any form, but it also allows you to determine if the correct information is being entered. The data you requested appear on screen, and you can sight verify its accuracy. While this sounds like computer sorcery, it is not difficult to do with many relational programs.

Some relational programs, like *Condor*, lack a lookup capability. Instead, they use "relational operators" to combine (join) different data files into new, temporary data bases that can then be used to generate complex reports or for interactive searching. While this technique works well, it may demand much writing of new disk files (which may be very time consuming), plus large amounts of disk storage capacity and fast drives—especially if you have large files.

The absence of a lookup function also means that you cannot immediately sight verify data, so data accuracy checks must be handled as a separate activity.

Question: So why doesn't everyone use relational data bases and forget about file managers?

Answer: For many applications, less complicated, easier to learn and use file manager programs may be appropriate. A program mentioned earlier, *DataEase*, is a good case in point. *DataEase* is a relational data base of considerable power. It is graced with all kinds of data entry and output capabilities. Even though *DataEase* can be classified as one of the more user-friendly designs in this class, it is not among the easiest to learn. The *DataEase* report generation function, in particular, is very versatile, but hard to master. By contrast, *Data Base Manager II* is a simple, well designed file manager. It is fast and among the easiest of data base programs to learn and use, but it has only a small fraction of the features that *DataEase* has.

If you are satisfied with the data handling and reporting capabilities of *Data Base Manager II* or one of its competitors, and do not really need the multiple file and other features of *DataEase* and its counterparts, then why go through the agony? More important, you may save a lot of time and effort and avoid catching a bad case of computer "bends"—a term not unfamiliar to fans of underwater diving movies. You get what you want from the easier program, are up and running much faster, and have saved a few bucks in the bargain.

As you will see in the table summarizing the features of our sample programs, the classification "file manager" covers a great deal of territory. The capabilities of these programs vary dramatically, ranging from the very limited *(FCM)* to the quite sophisticated *(UltraFile)*. The sub headings we have selected for the File Manager classification are mail list, text oriented, standard, and full featured.

Mail list managers have very few features. They are designed for mail list/label operations and little else. With *FCM*, for instance, you are limited to only 132 characters per record, and none of the 12 permitted fields may be longer than 24 characters. For many mail list applications, this is sufficient. The speed and operational simplicity of the package also should cut training and operator keying time, both of which are cost factors in business. *FCM* also can print up to nine mailing labels across a page, has an envelope addressing feature, and can export data to word processors and other programs.

The second category is for data base programs that are primarily text entry oriented. One text field can fill an entire

Types of Data Bases

screen, and searches for information can be done on a word search basis—you can search for any word that appears in any field of any record. Data may be divided into large numbers of fields, if you wish (*PFS* has the incredible upward limit of 3200 fields per record), and records can be split into many different screens. An interesting feature of *PFS* is "append," which allows additional screens of text to be added at the end of a record on an ad hoc basis.

A significant limitation of most text oriented programs is their lack of data entry editing capabilities. This means that you cannot set standards for entry of data into a *PFS* field; thus your computer cannot keep you from entering the wrong amount or type of data into a given field.

For example, you cannot tell the computer to limit a "city" field to only 20 characters, nor can you dictate that one or more fields contain only numeric data (dollars, integers, etc.) or have a specific number of decimal points. This makes data quality assurance very difficult. You also cannot set up calculated fields in a data record (e.g., store the product of a mathematical operation on two or more existing fields in a separate sum field on the same record). Calculated fields may be set up on reports generated by the program.

An exception to this statement is the *Nutshell* program, which attempts some data entry standards. The field length and date field restrictions of *Nutshell* work very well for the copy we reviewed, but a numeric field designation (numbers only) did not prevent the entry of alpha (letter) characters into such a field.

Despite these and other limitations, *PFS*-like programs are almost ideal for those who want to keep a great deal of textual information in a variety of fields, want it to be infinitely accessible via online searches and reports, and do not demand much data quality checking. Recipe and bibliographical data files are good uses for a text oriented data base.

A text oriented program should *not* be used in a highly structured situation in which data quality is of paramount importance and large amounts of information must be batch processed. Thus *PFS* and *Fast Facts* are not recommended, as promoted by some, for financial, accounting, or inventory purposes of any kind.

The bulk of file manager programs fall into the "standard" classification. Most have modest data entry edit and report generation capabilities, can perform record-by-record searches, generate mailing labels, interface well with word

Recipe and bibliographical data files are good uses for a text oriented data base.

processing and spreadsheet programs, execute their data sorting and other operations fairly fast, and are menu driven. Their capacities may vary dramatically, so you should check the limitations and characteristics of these programs carefully to make sure they fit your needs. In short, one or more of these programs should satisfy most people who need a file manager program.

Many new file managers appear on the market monthly. While most of these fit the "standard" classification, an increasing number of new releases are much more interactive than their older brethren. Among these is the *CIP* program, which offers excellent on-screen formatting of data entry screens and reports. Reporting capabilities are of particular significance, because you are not bound, as with many programs, to a static, columnar type of report, and you can vary report layouts to suit your needs. Such features are hard to describe adequately in writing and must be experienced to be fully appreciated.

Software producers seem to be inching closer to the model of interactive excellence set by the *Quick File* program and the data base portions of *Three EZ Pieces* and *Appleworks* for the Apple IIe and IIf, respectively. These programs are definitely among the most interactive and innovative file managers available today. You can literally customize any screen or report to fit your needs and actually see what you are doing on the screen. Data files are loaded into memory, so data search and sorting are extremely fast.

The memory dependent feature of these programs is an advantage and a disadvantage. Record access and manipulation are extremely fast, but file size is limited by the amount of available RAM. In addition, sorts can be performed only on one file; there is no data entry quality checking, nor is it possible to perform global updates of data (i.e., all fields meeting certain criteria are updated simultaneously). I hope that the producers of *Quick File* and its competitors will see the light and develop versions that retain the speed and other characteristics of these programs, take advantage of the superior memory size of the IBM PC and other 16 bit computers, and add the above mentioned capabilities.

The classification "full featured" is reserved for those programs that offer more than the conventional. *Ultrafile* clearly fits into this category. It is a full fledged business-type file manager with graphics capabilities and perhaps the most complete array of data entry editing features available for a file manager.

Before leaving the file manager classification, it is appropriate to mention the large number of filer type programs sold with word processing programs. Database programs made by the same company are available for *Easy Writer, Palantir, Benchmark*, and many other word processors. These programs normally are of the mail list type. The complete integration they offer with the parent word processor is highly attractive, but they may not have the broad array of capabilities available with standard file managers. Check these out carefully before you purchase one, with special at-

tention given to their data import and export features—some lack one or both of those capabilities. A good file manager produced by someone else may be a far better buy and one that will satisfy your needs for a longer period of time.

Also, if you have or plan to purchase a new word processor, be sure that the file manager you select produces files that the processor can use (read) with its form letter (mail merge) function. Many programs, like *WordStar*, use data files that are "comma delimited"—with commas separating each field, quotation marks around text fields, and each record on a separate line. Others use the one-field-per-line convention. Most database programs can produce files like these, and most word processors use one or the other of these standards. As with other things in life, however, there are always exceptions to the rule. For example, *Word Perfect*, *MultiMate*, and the new *Display Write II* program from IBM have totally different requirements.

If you have a word processor, be sure that your file manager produces files that it can use with its form letter function.

There are two programs listed in the "Other" category: *Appleworks* and *NPL*. These have features which distinguish them from their brethren in some notable ways. For example, *Appleworks* not only has the highly interactive data base mentioned earlier, but it also includes a word processor of modest capabilities and a spreadsheet of the *VisiCalc* genre. Data are directly transferable between each component.

The current version of *NPL* is a capable but somewhat awkward to use data base program that has perhaps the most powerful "ad hoc query" language available for microcomputers, as evidenced by the example shown under that heading in the next section of this article. *NPL* would be an excellent partner for an otherwise good program that needs a beefed up query capability. If you need a major improvement of this type for your application, *NPL* may be the answer; however, be certain that no data file compatibility problems exist before you take the plunge.

A Lexicon of Data Base Terms

In the next few paragraphs, we will explore the terminology commonly associated with data base programs. This type of information is essential to your understanding of data base features and capabilities, and for making an informed decision on which of these capabilities are important to you. Definitions are arranged in the order shown in the "Data Base Comparison Chart," with the number shown in brackets referencing the appropriate column (if any) of that table.

The language of the computer addict, like that of any other group of mortals, abounds with synonyms. One person's "save" information to a disk drive is another person's "write" to such a device, even though both terms mean precisely the same thing. Commonly used synonyms are shown in parentheses.

We have not attempted to define the difference between a "database" and a "data base" (yes, Virginia, there is a difference, and one that aficionados take quite seriously). You may write to me for the answer to this riddle, and I hope that you will understand my response.

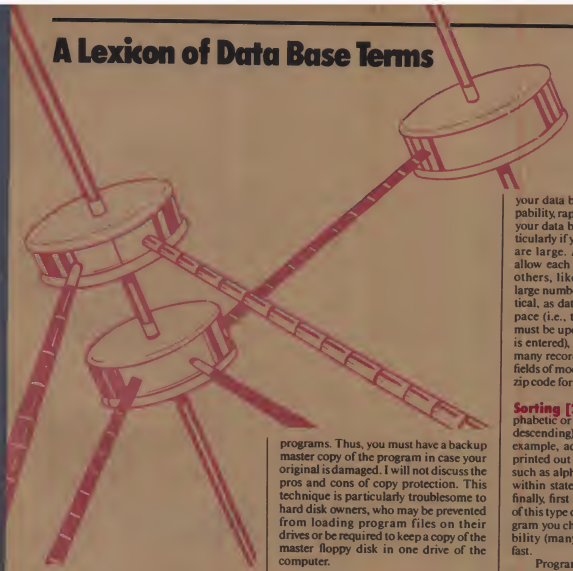
Records with large numbers of fields become cumbersome and may necessitate data screens that are difficult to read.

DBMS The abbreviation for Data Base Management System; the generic name for any computer program that allows you to set up and operate a data base on your machine.

Field [11] Each data entry item (attribute) listed in your data base, such as "last name" or "city." Several relational data base programs permit 200 or more fields per record. While this is an interesting capability, it may not mean much from a practical standpoint. If you purchase a relational data base, it is better to break up large numbers of fields into separate files. Records with large numbers of fields become cumbersome and time-consuming to handle, and may necessitate data screens that are difficult to read.

Record [10] A group of fields that is treated as a unit. A recipe card is a record that contains fields for each ingredient and preparation instruction. While most

A Lexicon of Data Base Terms



Masks are special characters that are used to offset or divide data fields.

data bases allow tens of thousands, if not millions of records per file, this is of little consequence if you are using low capacity disk drives. If you plan no more than a few hundred records per file and have no plans to buy a hard disk drive (see below), this statistic should not influence your decision.

File [9] A collection of records that are stored together. A file (relation) also contains information on how you want your data stored (e.g., field names and characteristics) and displayed. Some programs, like relational data bases, can access more than one file concurrently.

Copy Protection [6] Methods used by software producers to prevent any copying (authorized or unauthorized) of their programs. Thus, you must have a backup master copy of the program in case your original is damaged. I will not discuss the pros and cons of copy protection. This technique is particularly troublesome to hard disk owners, who may be prevented from loading program files on their drives or be required to keep a copy of the master floppy disk in one drive of the computer.

Data Field Masking [14] Masks are special characters that are used to offset or divide data fields. For date fields, the slash or hyphen characters are often used to divide the month, day, and year (e.g., 02/23/84). For telephone numbers, the parentheses and hyphen characters may be desired: (999) 999-9999. Similar types of characters may be used for part numbers or in other fields where such offsets improve the readability of character strings. These masks can be inserted by the computer, so that an operator does not have to enter the hyphen or other character manually (e.g., only the numbers 022384 are entered in the above date field, with the slashes inserted automatically). This feature greatly simplifies data entry and ensures standardization. Some programs routinely mask fields, such as date and telephone number. Programs like *InfoStar* have extremely versatile custom field masking; others like *Condor* and most file manager programs have neither standard nor custom masking.

Indexing [24] The capacity to select certain fields for rapid (key) searching of your data base. Without an indexing capability, rapid access of information from your data base may not be possible, particularly if your data files and record sizes are large. *DataEase* and some others allow each field in a file to be indexed; others, like *Condor*, only one field. A large number of indexed fields is impractical, as data entry may slow to a snail's pace (i.e., the index file for each field must be updated each time a new record is entered), particularly if a file contains many records. Usually, only one to three fields of modest length, such as name and zip code for a mail list file, are indexed.

Sorting [25] Re-ordering data in alphabetic or numeric order (ascending or descending) by one or more fields. For example, address information could be printed out with several levels of sorting, such as alphabetically by state, then city within state, last name within city and, finally, first name. If you do a great deal of this type of sorting, make sure the program you choose has multiple field capability (many do not) and is reasonably fast.

Programs like *Condor* destroy your index file each time the master file is sorted; thus you would make a copy of the file with that type of program and then sort the copy. This may create some disk space problems if you use low capacity floppy disk drives. The sorting action may also require substantial amounts of blank disk space (sometimes two or more times the size of the file being sorted), if the sort is being performed on disk rather than in memory. Make sure your disk drives can handle any added burden. Needless to say, memory sorts are faster. Programs like *Data Base Manager II* have excellent sorting capabilities. Files of up to 2500 records in length are sorted in memory, and those above that on disk.

Data Import [16] The ability to use (read) information developed with another program. This is particularly important if you change data base programs and do not want to reenter existing data into your new program manually, or exchange information with a spreadsheet program like *Lotus 1-2-3*.

Data Export [17] The opposite of import: the capacity to transport (write) in-

formation from your data base in a form that can be used (read) by another program, such as a word processor for form letters and reports, a spreadsheet, or a different data base. The best of these functions, like those in *Data Base Manager II, Condor* and *Ultrafile,* can interface with almost any other program available on the market today.

Menu [7, 8] A series of choices listed on the computer screen, much like a restaurant menu. With such programs, you simply press a key to initiate the action you want to take.

Some programs require that all actions be selected from a series of menus and submenus (enter a new record; search for a record; run a report, etc.). These are called menu driven or menu dependent programs. Most file manager and many relational data base programs are menu dependent. The *DataEase* relational data base program is a classic example of that approach.

Other programs, like *dBase II,* provide little built-in menu help. These are called command driven programs, as you must know and manually enter (key in) the appropriate commands for each action.

Some people feel that menu dependent programs are easier to learn and use, and reduce the incidence of operator errors. Others dislike the rigidity of a menu structure and believe that it is faster and less cumbersome to memorize and then enter commands manually, without being required to page through a series of menus and submenus. There is merit to both arguments.

Many relational data base programs permit users to create custom menus for their data base applications so that all instructions can be as unambiguous as possible, and operator confusion may be reduced to a hypothetical minimum. In the *DataEase* program, for example, there is a series of standard menus for all data base functions. Paging through these menus for a given action (e.g., running a specific report, when there may be 30 or more already designed) can be a difficult, time-consuming and intimidating procedure. To combat this potential confusion, *DataEase* permits special menus to be designed. These menus contain only those options needed by the individual user, who is not then confronted with extraneous information. *DataEase* permits an infinite number of users and menus to be defined, and these menus can be integrated with a password system (see below).

Ad Hoc Query [22] The ability to recall information contained anywhere in a file, using simple English language commands (e.g., "Print city state zip phone by lastname by firstname where college is Harvard"). The resulting information can be sent to the screen of your computer, a printer, or a disk drive for storage and later use. In the above example, derived from the *NPL* program, the requested name and address information would be obtained only for those people who attended Harvard University, and would be sorted by last name and then first name. This is one of the most powerful features of a good data base program.

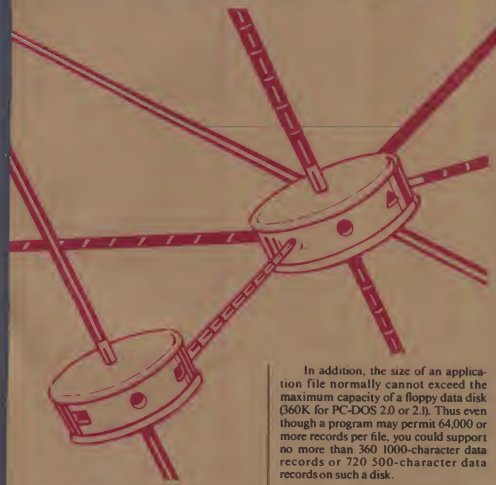
The ad hoc query capabilities of data base programs vary widely. The *DataEase* query function (called "One Time Only" reports) is cumbersome to use. Others permit only record-by-record search on a single file. The best of these, like *NPL* and *R:Base 4000,* have very elaborate query functions (sometimes called non-procedural languages), that are a delight to use.

Screen Generator [18] A special program (utility) to create customized screen displays. Screen generators allow you to arrange (paint) fields on the screen to suit your needs and preferences. The most common use of this feature is for data entry screens. With many programs, all fields are lined up on the lefthand side of a screen. It may be more desirable, however, to display associated items together (city next to state next to zip) and to improve the readability of the screen by leaving blank spaces between various natural groupings (e.g., address and telephone information).

Screen generators let you arrange screen fields to suit your needs and preferences.

Some data bases also allow you to enter other types of information on the screen, to provide guidance (help) in how to fill-in each field properly. *Condor* and *DataEase* are excellent examples of the latter. Others, like *dBase II,* lack or have very rudimentary generators, but you can use their built-in programming languages (see next page) to create elaborate custom screens.

A Lexikon of Data Base Terms



Disk Drives The most commonly used storage devices for microcomputers are floppy and hard disks. Typically, floppies will hold from 140K to 1250K of data, with each K equivalent to roughly 1000 characters of information. Hard disk drives range from 5Mb up, with each Mb comprising about 1 million characters. Hard disk drives of more than 10Mb are popular for larger applications.

The primary consideration in selecting a disk drive for your system is, of course, program/application size. Many, if not most, new data bases have large program files (i.e., the master files included with your program that are needed to create and operate any application you develop). In general, the more user-friendly features a program has, the more program file space will be required.

The program files for *Ultrafile*, for example, occupy more than 1Mb of disk space. This means that the IBM PC version of that program is located on four 320K disks, and a great deal of disk swapping (inserting of alternate disks) may be necessary during the course of an application design, update, or reporting session.

In addition, the size of an application file normally cannot exceed the maximum capacity of a floppy data disk (360K for PC-DOS 2.0 or 2.1). Thus even though a program may permit 64,000 or more records per file, you could support no more than 360 1000-character data records or 720 500-character data records on such a disk.

A library file of existing report layouts can speed up the design of new reports.

The above constraints can be eliminated if you have a high capacity, fast access hard disk drive. Recent breakthroughs in hard disk prices have reduced the cost of 10Mb drives to under $1000. For this relatively meager price you can obtain 30 times the storage capacity of an IBM floppy for less than four times the price (assuming $250 for a compatible floppy unit), and kiss disk swapping goodbye forever. Such a purchase is highly recommended for anyone who plans multiple applications or has a single application that demands great amounts of storage space.

File Backup Copies of data files, which can be used to reactivate (restore) a data base that has been damaged or destroyed. Despite the best laid plans of men and machines, problems can and do occur. The best way to confront potential data base problems is to back your files up regularly (at least daily). Most commonly, this is accomplished by using the file backup routine of your operating system to copy existing files to floppy disks.

If your files are relatively small, this is a quick and efficient process. If they are large, you may want a second hard disk or a cartridge tape set up, such as those sold by Corvus and Tall Grass. The easier and faster you can make this backup process, the more inclined you and your staff will be to use it regularly. Additional equipment costs may prove to be far less "expensive" than the time, effort, potential for error, and loss of business that may result from having to re-enter information by hand.

Data Storage Techniques [15] The methods used by your program to store data files. The most common techniques are text files with fixed length or variable length records. The variable length technique uses only the amount of space needed for your data. If a field is blank, little or no storage space is needed for that field. Fixed length records always require the same amount of disk storage, and spacing characters are inserted in totally blank fields or those that are only partially filled.

Storage technique is an important consideration if you have small capacity disk drives and wish to cram as much data as possible onto them. Data bases using the fixed length technique normally require substantially more disk space than their variable length counterparts. Most relational data bases use the fixed length technique.

Report Writer [21] A subprogram (utility) to generate standard and custom reports from information stored in your data files. The capabilities of various data base programs range from the mundane (simple lists) to the elaborate (reports of almost any description, that can combine data from many sources). Some programs have multiple report writing features.

For example, *Ultrafile* can generate lists of several types with its Browse function, print records in the data entry/modification mode, and produce many different types of custom designs with its

main report generator, including any number of mail labels across a page. One interesting feature of *Ultrafile* and some other programs is the ability to generate internally form letters that use name and address data stored by the data base, and also permit customized reports (designed with the main report writer) to be inserted into the text of a form letter.

Batch Processing [19] The capacity to process routine tasks sequentially, without operator intervention. For example, you may routinely want to index or sort your files and print sets of reports at the end of a day or after completing a data entry session. This can involve multiple user inputs, and require that someone be present to enter new commands as needed. Batch processing functions that operate within a program can eliminate this bother, by permitting sets of operations to be strung together and executed with a single command. This is a highly desirable feature.

Programming Language [20] A high level computer language that can be used to create customized applications and report designs for a data base. Most data base programs lack this capability, and only their standard functions may be used. Some, like *dBase II*, have relatively rudimentary standard functions, but can use a built-in computer language to create highly complex custom applications. For example, the standard *dBase II* report writer is rather unsophisticated, and you must use its programming language to design more complex reports. The *dBase* language is very similar to Basic, with one important exception: the built-in features (functions) of *dBase* can be used (called) in your programs, thereby substantially reducing the amount of computer code you must write. This means that *dBase* applications can be as versatile as you like, yet be far easier to develop than those designed exclusively with Basic or another programming language.

Other programs, like *RL-I*, lack an internal programming language, but can interface directly with an external version of Basic, Fortran, Cobol, Pascal, or some other standard high level language.

If you intend to buy a program that uses a complex internal or interface language for certain functions, the time required to learn and use the program may be far greater than with other types of relational data bases. Coded instructions can be intricate to develop, and debugging can get quite involved. Make sure you really need this degree of versatility and capability before committing yourself, a consultant, or a staff member to the level of effort that will be demanded. Also, if a highly complex *dBase* application is contemplated, you should allocate a fair chunk of time for modifications some six months after the initial design has been implemented.

Documentation Detailed information on how your program is designed, including field, record, and report layouts. Many data base programs are self documenting. That is, a running list of your design is maintained by the computer and can be listed to the screen or a printer. This information serves as a basis for examining the program in detail, and determining what changes should be made to improve performance and overcome problems.

A library file of existing report layouts also can speed up the design of new reports. You simply examine the characteristics of a "successful" report of similar design and make the necessary modifications.

DataEase provides an excellent example of good self documentation. Every aspect of a design is preserved in detail, including data entry forms, reports, custom menus, system and printer configurations, and approved users (passwords).

Password [23] A secret code assigned to specific users to control access to a data base. The assigned code must normally be entered at the time a program is booted, or access will be denied. Several data bases employ this feature to restrict use of the program to those with a "need to know." A variety of password techniques are used. With some, proper entry of the password (which can be a software license number, as with *Condor*) gives access to any and all features of the program without restriction. Others assign custom passwords and limit access only to certain parts of the data base or the specific activities listed on a menu. If you demand this feature, be sure that the program you select provides the level of protection needed. ■

Epilogue

There are several topics that have not been considered in this article, such as multi-user applications and local area networking (LAN). Future articles will explore the special world of multi-user data base software, and examine the state of the art and controversies surrounding multi-user oriented operating systems (e.g., the emergence of Unix, Xenix or some as yet unspecified IBM entry as the industry standard). While germane in the broadest sense to the theme of this article, this subject matter is best left for another time.

In addition, this article does not critique individual programs. It provides a compendium of what is available, and guidance on how to make a reasonably appropriate selection. In-depth articles will be forthcoming on the best of the old and the new. Of particular interest are upgrades and supplements to well accepted programs like *R:Base 4000* and *PowerBase*, and the new *dBase III*.

Good luck in your quest. We hope that our efforts have made your data base search an easier and more productive task. ■

DATA BASE COMPARISON CHART

Program Name [1]	Mkr. Code [2]	List Price [3]	Data Base Type [4]	Operating Systems [5]	Copy Protected [6]	Menu Driven [7]	Custom Menus [8]
FCM	1	$125	File Mgr/Mail	APM	No	Yes	No
Pony Express XL	2	238	File Mgr/Mail	MP	No	Yes	No
CIP	3	395	File Mgr/Std	P	No	Yes	No
Data Base Manager II	4	295	File Mgr/Std	MP	No	Yes	No
Friday!	5	195	File Mgr/Std	CDMP	No	Yes	No
Please	6	349	File Mgr/Std	P	No	Yes	No
Power-Base	7	395	File Mgr/Std	P	Yes	Yes	No
ResQ	8	295	File Mgr/Std	MP	No	Yes	No
TIM IV	9	495	File Mgr/Std	PM	No	Yes	No
Fast Facts	9	195	File Mgr/Text	MP	No	Yes	No
Nutshell	10	395	File Mgr/Text	MP	No	Yes	No
PFS:File/Report	11	265	File Mgr/Text	AMP	Yes	Yes	No
Advanced DB Master	12	595	File Mgr/Std	P	Yes	Yes	No
InfoStar Plus	13	495	File Mgr/Full	P	No	Yes	Yes
Mag/Base 3	14	795	File Mgr/Full	CDMP	No	Yes	Yes
Ultrafile	1	195	File Mgr/Full	PM	No	Yes	No
Condor 3	15	650	Relational	CDPM	No	No	Yes
DataFlex	16	995	Relational	CDMP+	No	Yes	Yes
DataEase	17	595	Relational	MP	No	Yes	Yes
dBase II	5	500	Relational	C	No	No	*
dBase III	5	695	Relational	P	No	Yes	*
Knowledge Manager	18	500	Relational	CMP	No	No	Yes
Ph.D.	19	495	Relational	MPCD+	No	Yes	No
R:base 4000	20	495	Relational	PM	No	No	No
Revelation	21	950	Relational	P	No	Yes	Yes
RL-1	22	495	Relational	MP	No	Yes	No
10-Base	23	495	Relational	MP	No	No	No
Appleworks (Data base)	24	250	Other	B	No	Yes	No
NPL	25	500	Other	ABMP	No	No	Yes

[5] Operating Systems: A=Apple; B=Apple SOS; C=CP/M 80; D=CP/M 86; M=MS-DOS; P=PC-DOS; +=Others

Data Base Paraphernalia

	Maximums					
Files Open At Once [9]	Records Per File [10]	Fields Per Record [11]	Characters Per Record [12]	Characters Per Field [13]	Custom Masking [14]	Storage Technique [15]
1	25,000	12	132	24	No	Variable
1	No limit	12	127	26	No	Fixed
1	65,000	40	2000	50	No	Fixed
1	32,000	40	2400	60	No	Fixed
1	65,000	32	999	32	No	Fixed
1	16 million	99	2000	999	No	Fixed
1	65,000	64	1600	80	No	Fixed
1	32,000	60	1024	80	Yes	Fixed
1	32,000	40	2400	60	No	Fixed
1	1500	5000	80,000	1679	No	Fixed
1	2 billion	60,000	16 million	16 million	No	Variable
1	No limit	3200	No limit	1679	No	Variable
1	No limit	250	3000	250	No	Fixed
1	64,000	255	64,000	255	Yes	Variable
1	999,999	999	2500	250	Yes	Fixed
1	32,000	50	1000	100	No	Variable
See notes	65,000	127	1024	127	No	Fixed
125	65,000	255	4000	255	Yes	Fixed
No limit	65,000	255	8000	255	Yes	Fixed
2	65,000	32	1000	254	*	Fixed
10	2 billion	128	4000/512K	254/512K	*	Both
No limit	65,000	255	65,000	65,000	Yes	Fixed
See note	1.6 million	1024	2300	79	Yes	Variable
40	2 billion	400	1530	1500	No	Fixed
No limit	5000	32,000	32,000	65,000	Yes	Variable
No limit	65,000	No limit	No limit	1023	Yes	Fixed
16	No limit	No limit	32,000	9999	No	Fixed
1	Variable	30	2340	78	No	Variable
1	65,000	100	4000	80	Yes	Fixed

As with other types of computer programs, there are many accessory items and materials to assist users of data base programs. We will look at two types of data base paraphernalia: books and *dBase* related application generators and utilities.

There are very few good books on microcomputer based data bases, except for those that are software reviews or deal specifically with *dBase II*. This situation is not unreasonable, as computer periodicals are excellent sources of information on what is current and of interest with micro based programs. It is also testimony to both the popularity of and the difficulty of learning *dBase*, and the comparative ease with which one can master more user-friendly software. Most non-microcomputer oriented books tend to dwell on data base theory and design, with a primary focus on large mainframe systems, for those who would design their own programs from scratch. The latter textbook-like volumes may be of little interest to most microcomputer owners.

A book that is recommended for anyone who wishes to develop a good understanding of data base concepts is *Data Base Management Systems: A Guide to Microcomputer Software* by David Kruglinski (Osborne/McGraw-Hill). This is not another software review book. Kruglinski discusses the rudiments of good data base systems and uses program examples (*Condor* and *dBase*, among others) to illustrate his points.

Among the best *dBase*-specific books are *dBase Users Guide* by Adam B. Green (Software Banc); *Mastering dBase* by Paul W. Heiser (Prentice-Hall), and *Using dBase II* by Carl Townsend (Osborne/McGraw-Hill). Each of these helps make up for the deficiencies of the *dBase II* user's manual and makes the mastery of this powerful but troublesome program a bit easier.

DATA BASE COMPARISON CHART

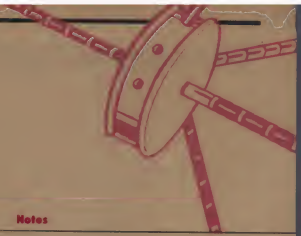
Program Name [1]	File Importing [16]	File Exporting [17]	Multi. Custom Entry Screens [18]	Batch Processing [19]	Program Language [20]	Elaborate Reports [21]	Elaborate Ad Hoc Inquiries [22]
FCM	No	Yes	No	No	No	No	No
Pony Express XL	No	Yes	No	No	No	No	No
CIP	Yes	Yes	No	No	No	No	No
Data Base Manager II	Yes	Yes	Yes	No	No	No	No
Friday!	Yes	Yes	No	No	No	No	No
Please	Yes	Yes	Yes	No	No	No	No
Power-Base	Yes	Yes	Yes	No	No	No	No
ResQ	Yes	Yes	No	Yes	No	No	No
TIM IV	Yes	Yes	Yes	No	No	No	No
Fast Facts	Yes	Yes	Yes	No	No	No	No
Nutshell	Yes	Yes	No	No	No	No	No
PFS:File/Report	No	Yes	Yes	No	No	No	No
Advanced DB Master	Yes	Yes	Yes	No	No	No	No
InfoStar Plus	Yes	Yes	No	Yes	No	Yes	No
Mag/Base 3	Yes	Yes	Yes	Yes	Yes	Yes	No
Ultrafile	Yes	Yes	Yes	No	No	No	No
Condor 3	Yes	Yes	Yes (16-bit)	Yes	No	Yes	Yes
DataFlex	Yes	Yes	Yes	Yes	Yes	Yes	No
DataEase	Yes	Yes	Unlimited	Yes	No	Yes	No
dBase II	Yes	Yes	*	*	Yes	*	Yes
dBase III	Yes	Yes	*	*	Yes	Yes	Yes
Knowledge Manager	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ph.D.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R:base 4000	Yes	Yes	No	Yes	No	Yes	Yes
Revelation	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RL-I	Yes	Yes	No	Yes	No	No	Yes
I0-Base	Yes	Yes	Yes	Yes	No	No	Yes
Appleworks (Data base)	Yes	Yes	No	No	No	No	No
NPL	No	Yes	Yes	Yes	No	Yes	Yes

Based on discussions with Ashton-Tate staff and recent press releases by various companies, we predict that the introduction of *dBase III* will further stimulate the publishing and satellite software industries. It is easy to envision many new releases guaranteed to "simplify" the life of the neophyte *dBase III* user, given the myriad of modifications and additional capabilities built-in to the heir apparent to the *dBase* throne.

In the softwdre arena, the preponderance of programs again are *dBase* oriented. Most of these try to overcome the most serious user problems with *dBase*, including difficulty in setting up an application, slow file sorting, lack of password protection, and the like.

The largest single grouping of *dBase* related items appears to be application generators, such as the *Quickcode* ($295), *dBase Window* ($249), *dProgrammer* ($295) and *Autocode* ($195) packages. Each of these attempts to make life easier for the *dBase* owner by automating the generation of the *dBase* program code needed for a data base.

It is quite simple with *Quickcode*, for example, to set up a mailing list application that allows you to generate files that are readable by *WordStar* and can directly output mail labels. None of these



Password Capability [23]	Multiple Index Fields [24]	Multiple Sort Fields [25]	Built-in Graphics [26]	Multiple Mail Labels Across Page [27]	Notes
No	No	Yes	No	Yes	
No	No	Yes	No	Yes	All fields are pre-defined
Yes	Yes	Yes	No	Yes	
No	No	Yes	No	Yes	Has some relational data base features
Yes	Yes	Yes	No	Yes	Can be used as screen generator for dBase II
No	Yes	Yes	No	No	
No	Yes	No	No	No	
Yes	Yes	Yes	No	Yes	
Yes	Yes	Yes	No	No	
No	No	Yes	No	Yes	
No	Yes	Yes	No	No	
No	No	Yes	No	No	Assumes purchase of both PFS:File and Report programs
Yes	Yes	Yes	No	No	
Yes	No	Yes	No	No	Multiple files can be referenced in reports
Yes	Yes	Yes	No	Yes	
No	Yes	Yes	Yes	Yes	
No	No	Yes	No	No	Multi file actions require relational operators
No	Yes	No	No	No	Uses index keys for sorted output
Yes	Yes	Yes	No	No	
No	Yes	No	No	No	All items with an * require custom programming
No	Yes	Yes	No	Yes	See above; 512K characters if all fields are variable length, 254 if all are fixed length
*	Yes	Yes	Option	Yes	
No	Yes	Yes	No	No	Files open at once: 8-bit machines, 8 files; 16-bit machines, 16 files
Yes	Yes	Yes	No	No	
Yes	Yes	Yes	No	Yes	
No	Yes	Yes	No	Yes	Interfaces with Cobol, Fortran, Pascal, Basic, C and Assembler languages
No	Yes	Yes	No	No	Interfaces with C and Assembler languages
No	N/A	No	No	No	Has word processing and spreadsheet; number of records varies with available memory; sold as Three EZ Pieces for Apple III
No	Yes	Yes	No	No	

No program can relieve you of the time and effort needed to prepare a truly complex data base application.

programs can, however, relieve you of the time and effort needed to prepare a truly complex data base application. You may quickly outgrow these programs as your facility with *dBase* increases. There is simply no quick and effortless way to master a complex program.

Those interested in other *dBase* enhancements may find help in the following list:

- *dSecur* ($99) to provide password security, a feature that even the new *dBase III* does not offer.
- dBPlus ($125), a super fast data file sort utility.
- dGraph ($295) for the direct generation of graphs from *dBase* data files.
- dUtil ($99) a general utility to assist in the editing of *dBase* programs.
- dB/RA ($200) a programmer's utility for creating of arrays in *dBase* programs and increasing the number of potential memory variables to 65,000.
- dBRx ($150) another programmer utility to add a variety of mathematical functions that are not available with *dBase II*.

And the beat goes on. Attempts have been made to overcome all of the significant problems with *dBase*. If you are or intend to become a *dBase* user, an examination of some of these will be in order, but with the usual caveat to look with care and buy with caution. ■

A Directory of Data Base Management Systems

Company	Product Name
A. Data Base Processors	
Continental Software 11223 S. Hindry Ave. Los Angeles, CA 90045 (213) 410-3977	FCM UltraFile
BK Services LTD. 418 Yeshiva Plaza Lakewood, NJ 08701 (201) 364-3005	Pony Express XL
Concentric Data Systems 18 Lyman St. Westboro, MA 01581 (617) 366-1122	CIP
Alpha Software Corporation 12 N.E. Executive Park Burlington, MA 01803 (800) 451-1018	Data Base Manager II
Ashton-Tate 10150 W. Jefferson Blvd. Culver City, CA 90230 (213) 204-5570	dBase II dBase III Friday!
Hayes Microcomputer Products, Inc. 5923 Peachtree Industrial Blvd. Norcross, GA 30092 (404) 449-8791	Please
GMS Systems, Inc. 12 W. 37th St. New York, NY 10018 (212) 947-3590	Power-Base
Key Software Inc. 2350 East Devon Ave. Des Plaines, IL 60018 (312) 298-3610	ResQ
Innovative Software 9300 W. 110th St. Overland Park, KS 66210 (913) 383-1089	Fast Facts T.I.M.
Leading Edge Products Inc. 21 Highland Cir. Needham Heights, MA 02194 (800) 343-3436	Nutshell
Software Publishing Corporation 1901 Landings Dr. Mountain View, CA 94043 (415) 962-0191	PFS:File PFS:Report
Stoneware, Inc. 50 Belvedere St. San Raphael, CA 94901 (415) 454-6500	Advanced DB Master
MicroPro International 33 San Pablo Ave. San Raphael, CA 94903 (415) 499-1200	InfoStar Plus
MAG Software, Inc. 21054 Sherman Way Canoga Park, CA 91303 (213) 883-3267	MAG/base 3
Condor Computer Corporation 2051 S. State St. Ann Arbor, MI 48104 (313) 769-3988	Condor 3
Data Access 4221 Ponce de Leon Blvd. Coral Gables, FL 33146 (305) 466-0669	DataFlex
Software Solutions, Inc. 305 Bic Dr. Milford, CT 06460 (800) 243-5123	DataEase
Micro Data Base Systems, Inc. P.O. Box 248 Lafayette, IN 47902 (317) 463-2581	Knowledge Manager
Micro Business Applications, Inc. 12281 Nichollet Ave. S. Burnsville, MN 55337 (800) 622-5463	PhD.
Microrim, Inc. 1750 112th Ave. N.E. Bellevue, WA 98004 (206) 453-6017	R:base 4000
Cosmos, Inc. 19530 Pacific Highway S. Seattle, WA 98188 (206) 824-9942	Revelation
ABW Corporation P.O. Box M1047 Ann Arbor, MI 48106 (313) 663-3011	RL-I
Fox Research, Inc. 7005 Corporate Way Dayton, OH 45459 (800) 358-1010	I0-Base
Apple Computer Corporation 20525 Mariani Ave. Cupertino, CA 95014	Appleworks
Desktop Software Corporation 228 Alexander St. Princeton, NJ (609) 924-7111	NPL
B. Data Base Systems Generators and Libraries	
Axel Johnson Corp. 666 Howard St. San Francisco, CA 94105 (415) 777-3800	Autocode 1
Gryphon Microproducts P.O. Box 6543 Silver Spring, MD 20906 (301) 946-2585	dB/RA dBRx
Tylog Systems, Inc. 9805 S.W. 152nd Ter. Miami, FL 33157 (305) 253-5942	dBase Window
Sensible Designs 5244 Edgepark Way San Diego, CA 92124 (619) 560-4583	dProgrammer
Fox & Geller 604 Market St. Elmwood Park, NJ 07407 (201) 794-8883	dGraph dUtil Quickcode
Micromedia Consulting Corporation Rockefeller Center Station P.O. Box 2082 New York, NY 10185 (212) 621-4710	dSecur
HumanSoft, Inc. 661 Massachusetts Ave. Arlington, MA 02174 (617) 641-1880	dBplus

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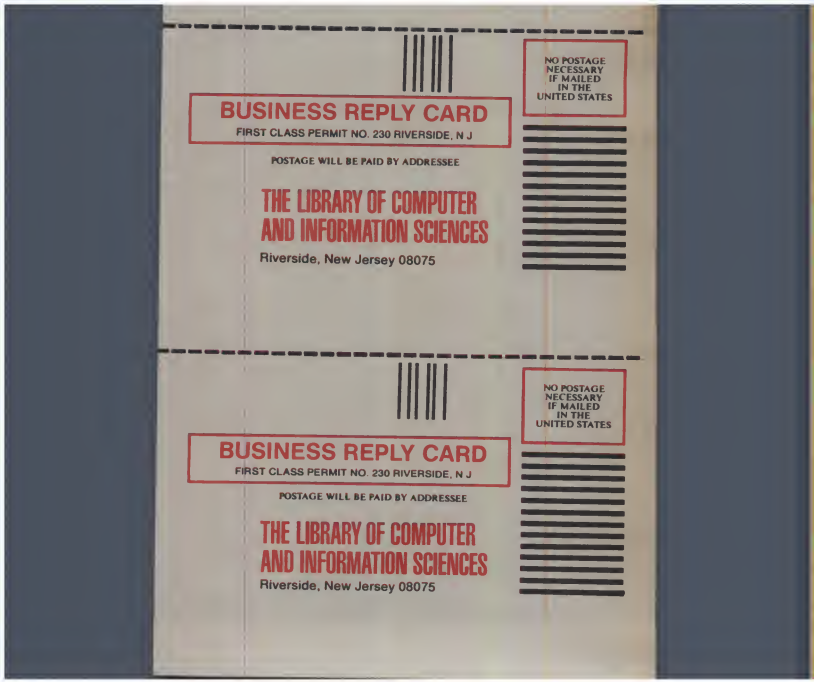

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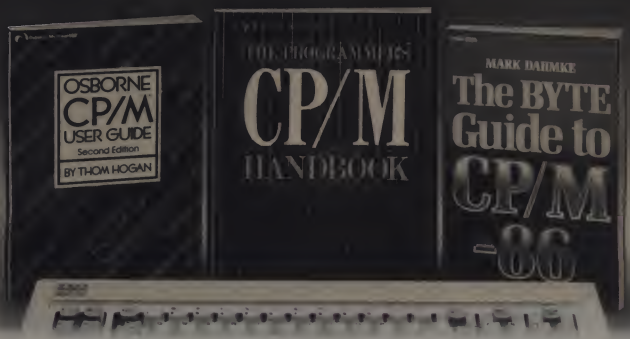

OSBORNE CP/M USER GUIDE. Second Edition. Thom Hogan.
This revised edition is a comprehensive user manual that is invaluable to beginners and advanced programmers alike. All of the latest CP/M developments are included, with special emphasis given to CP/M-86, the operating system for 8086- and 8088-based microcomputers. It is complete with reference lists and tables, and a full explanation of all CP/M commands and functions. Softbound.
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THE PROGRAMMER'S CP/M HANDBOOK. Andy Johnson-Laird.
Here is the single most comprehensive information source on CP/M you can purchase. Includes descriptions of CP/M's internal structure, the CP/M file system, Basic Disk Operating System, Basic Input/Output System, utility programs, and more. As a daily resource for the serious CP/M systems programmer, this Handbook is an absolute must. Hardcover.
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The BYTE Guide to CP/M-86. Mark Dahmke.
Now you can get the full story on CP/M-86—the program specifically designed for today's most powerful and advanced microprocessors. From one of the leading computer publications, this Guide clearly describes how CP/M-86 will operate with microcomputers using Intel 8086 or 8088, including the IBM Personal Computer. All commands and utility programs are discussed, along with application programs and support for high-level languages such as BASIC, Pascal, FORTRAN, and COBOL. Softbound. **Publisher's Price: $16.95.**

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The Quest for Sophisticated Simplicity

UltraFile

SOFTWARE EVALUATION

Bill Jacobson

Perhaps the most overworked term in the dictionary of computerese is "user-friendly." Although many hardware and software companies describe their products as such, the claim is not always justifiable.

In software the most commonly used techniques to evoke friendliness are menus and sub-menus, on-screen icons, help screens, and "English language commands." They are supposed to hold user confusion and learning time to a hypothetical minimum.

Like most of its competitors, Continental Software makes grandiose claims about the friendliness of their new *UltraFile* database program, to wit: "If you can press a button, you can use *UltraFile* to manage and organize information for your business or your home." Let's see how true this claim is.

UltraFile is the ultimate menu driven program.

The Architecture of UltraFile

UltraFile is a file manager program of classic design. That is, only one file can be open or accessed at a time. Unlike more comprehensive and expensive programs, two or more databases cannot be used simultaneously for data entry and report generation. This limitation is significant only if you have complex inventory, accounting, or other business systems that require the integration and simultaneous updating of several files. For mailing, client, and other types of single purpose lists, a database program like *UltraFile* is more than adequate and usually much cheaper.

The data storage capabilities of *UltraFile* are: 99 files per data disk; 32,000 records per file; 1000 characters per record; 50 fields (data items) per record; and 100 characters per field.

The Main Menu (Figure 1) provides an excellent overview of *UltraFile* functions. Although it is not readily apparent from this listing, *UltraFile* is divided into four quite distinct modules: Design, Update, Report, and Graphs. In fact the floppy disk version of *UltraFile* is contained on four 320K disks, each corresponding to one of the modules.

Despite this profusion of disks and programs, disk swapping is a surprisingly minor inconvenience. Each module (disk) can be booted separately. Thus, once the database and its reports have been designed, you usually boot the program with the Update disk. Obviously, the disks for Report and Graphs are needed for those specific functions.

For file and report redesign, the Define disk must again be used. The other options on the Main Menu are available on each disk.

If you have a high capacity hard disk drive, of course, all program modules may be mounted on that device, and you can access any segment of *UltraFile* without concern for such mundane matters as disk swapping.

UltraFile is the ultimate menu driven program. In addition to the menu shown in Figure 1, a wide variety of other menus and sub-menus guide you through an impressive array of tasks.

Installation

UltraFile master disks are not copy protected, so backups may (and should) be made using the Copy function of PC-DOS. The program can be easily adapted to your hardware by booting the Design disk and sequentially selecting the Utilities Menu and Hardware Configuration options.

File Design

After naming a new file, you immediately begin the field definition process, during which you must establish the data entry characteristics of each field. Samples of the options available are listed in Figures 2 and 3. Such features enable you to control the quality of data entries, as well as to simplify entry of certain types of information.

Once all fields have been defined, you can elect to use standard or custom data

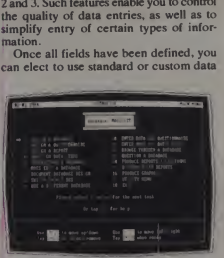


Figure 1. Main Menu.

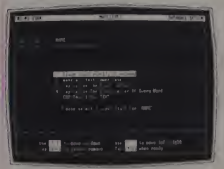
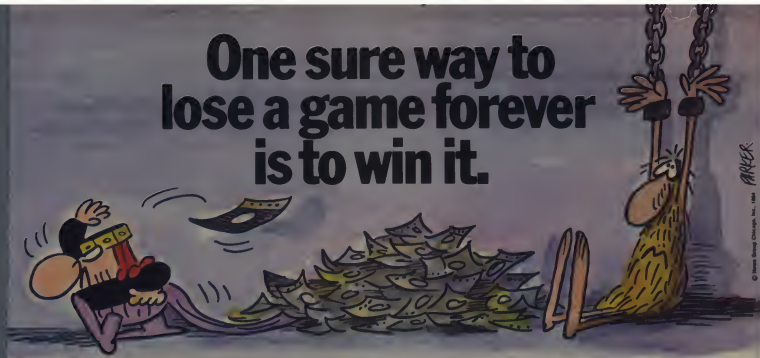


Figure 2. Data Entry Option A.

One sure way to lose a game forever is to win it.



The trouble with most games?

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Oh, by the way, with WizType,™ you'll learn to type this fastfastfast.

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entry screens. On standard screens, all fields are aligned at the left margin. An example of a custom screen is shown in Figure 4.

An important bonus of the custom screen feature is Footnote, in which user-defined instructions for each field can appear at the bottom of the screen during data entry. An instruction message can be up to 50 characters in length. It appears each time you add data to or edit a field. An example of a footnote is shown in Figure 4.

The well devised field definition and custom screen functions should improve data entry speed and accuracy.

Data Entry and Search

To add information to your new file, simply return to the main menu, and select item 10 (Enter Data Via Questionnaire). The custom screen that you just defined appears, and you can begin data entry. Available options are listed at the bottom of the page, and help screens appear with a touch of a function key.

Another form of data entry is the Batch File mode, with which you can read information prepared by most other programs into an *UltraFile* database. In addition, the Batch mode can be used in place of normal *UltraFile* data entry. This is important: if you find sequential data entry faster and more convenient (e.g., using commas to separate sequential strings of data fields); want to enter only a few fields; or need to replace (overwrite) records already in the file. Each record entered in the batch mode can be "confirmed" (visually verified in the questionnaire format), and all data entered are automatically checked against your data entry standards. This is an enormously powerful function, and is far and away the most versatile one I have encountered.

Once data entry is complete, you can print a register of the data you have just entered. This is an excellent idea, as it allows you to maintain a chronological listing of changes made to a file and to verify the accuracy of any entry. All database programs should have this capability.

Record search capabilities are divided into two types: Browse and Question. Browse is intended for scans of the entire file; Question for examination of a user selected portion of the file. Otherwise their capabilities are nearly identical. You have the following types of options:

- Select all or only a few data fields to display.
- Create special reports of subsets of records, which can be titled, indexed, sorted, printed, written to disk, or displayed on the CRT.
- Run calculations (mathematical manipulations) on sets of numeric fields.

These search functions are well designed and executed.

Reporting

Custom reports are columnar, and a wide variety of formatting and calculated column options are offered. Report width can be up to 132 columns. The design screen scrolls to the right for report columns that exceed the standard 80-character width of a CRT.

Columns can be "stacked," so that data items from each record can be located one over the other. Thus, there can be multiple lines of information per report, with data arranged for maximum legibility. See Figure 5 for an example of a report using stacking.

The output destination of a report can be of several types. In addition to printer and screen destinations, data can be sent to DIF, text and sequential files; to a special Data Statements file that can be incorporated into Basic language programs; and to form letters created with any text editor, including the EDLIN program on the PC-DOS master disk. You can, for example, edit an *UltraFile*-generated report by saving it to a text file, and then modifying and printing it using *WordStar*, or any word processor that can read such files.

Finally, you can design mailing labels using the Produce Reports/Files/Forms option on the Main Menu.

The number, type, and quality of data output devices available with *UltraFile* are impressive. Continental's designers seem to have accounted for every contingency.

Graphs

This function can be used only if you have a color graphics board or the equivalent in your IBM PC. If so, your data files can be graphed in monochrome or color using three-dimensional and standard bars, area graphs, connecting lines, overlays, and other display methods. It is not possible, however, to do pie graphs and more complex displays.

The results of your graphics designs can be saved to disk or printed with a dot matrix printer. An example of an *UltraFile*-produced graph is shown in Figure 6.

This is a simple to use, if relatively unsophisticated, graph function for those who have only an occasional need for such a device.

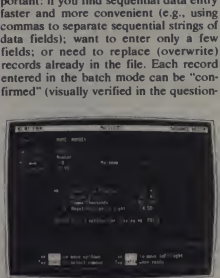

Figure 3. Data Entry Option B.

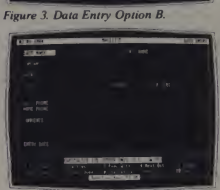

Figure 4. Custom Data Entry Screen.

Figure 5. Custom Report Sample.

Figure 6. Graphics Example.

Ease of Use and Performance

Each function is clearly defined, and on-screen instructions are easy to follow. A helping hand is extended each step of the way.

A variety of "goof" protection techniques also are used. For instance, those actions that may destroy data require more than a conventional *yes* or *no* response (e.g., to delete a record from the search mode, you must enter the full word *delete*).

Ease of use can sometimes translate into poor performance. The program overhead required to provide the menus and other aids in a "friendly" program can have its effect on how fast and well a program executes. Fortunately, this is not the case with *UltraFile*. Aside from a long program booting period (40 seconds), you can jump from one program function to another with alacrity. This was a pleasant surprise, given the impressive variety of features offered by this fine program.

Documentation

The user manual for *UltraFile* is contained in a loose-leaf binder, which is indexed but not tabbed. This is unfortunate, as tabbing would have improved its usefulness greatly.

The manual is well written, and I found most of its guidance and tutorials easy to follow. Many example screens are used throughout the manual, an excellent training and reference technique.

As indicated earlier, *UltraFile* is designed to be error resistant. It is hard to destroy data or pre-formatted reports inadvertently, or to back yourself into a corner. If you do get into trouble, the program advises you on the corrective steps needed.

SOFTWARE PROFILE

Name: UltraFile

Type: Database (File Management)

System: IBM PC/XT, IBM compatibles and PC-DOS

Format: Disk

Performance: Excellent

Ease Of Use: Very good

Documentation: Very good

Summary: Highly flexible and powerful menu driven program.

Price: $195 (plus $20 for warranty registration fee)

Manufacturer:
Continental Software
11223 South Hindry St.
Los Angeles, CA 90045
(213) 410-3977

Technical Support

Most software producers offer technical advice at no cost to registered owners of their software. Some even provide free program updates as well as toll free telephone numbers. Such is not the case with *UltraFile*. If you want the niceties of advice and updates, you must pay a one-time up front fee of $20. The cost of a call is not included.

A small charge for program updates is certainly reasonable. Fees for technical advice seem out of line, however, especially for a program that is touted as a paradigm of friendliness.

Summary

UltraFile is an easy to use database program with many attractive features. Its data entry, search and output operations work extremely well, and the built-in graphics function is an added attraction.

If you are in the market for a general purpose file manager that is versatile, highly capable, and relatively foolproof, you would be hard pressed to beat *UltraFile*. ■

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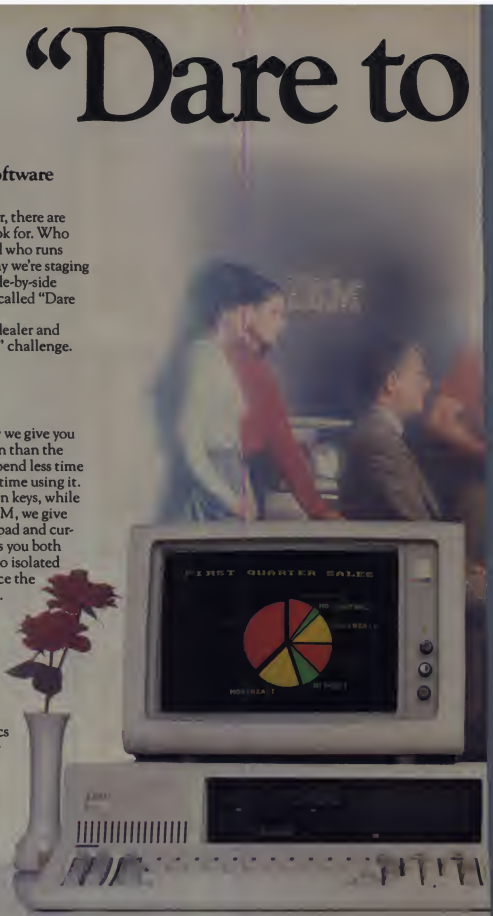

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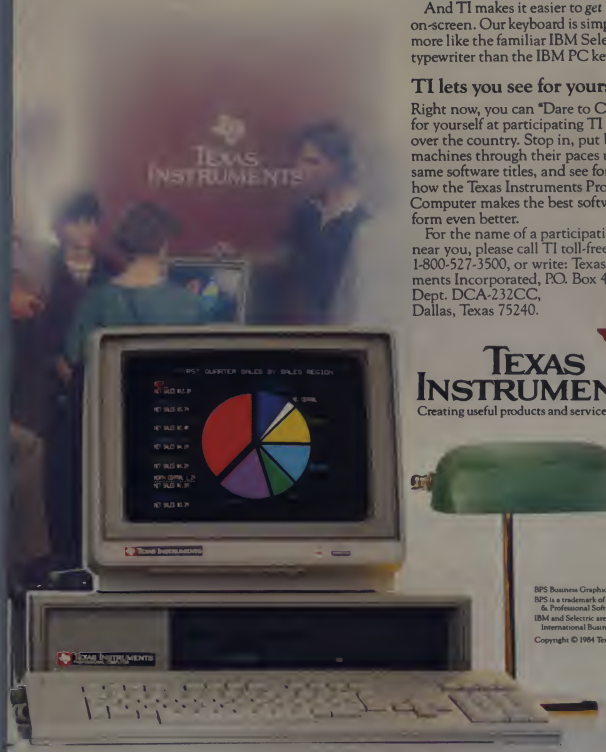

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Growing Up Literate

Of Time and Turtles

Time Bound

Time Bound is definitely unique. We have never seen anything quite like it, and thus feel at a loss to describe it. It deals with facts—most of them historical—yet it is a great deal more effective and entertaining than simple matching or quiz games.

The scenario places you, along with a careless chap named Anacron, in a time machine. Anacron, it seems, has fallen into the time machine and is tumbling out of control between the years 0 and 2000. Your assignment is to figure out where he is and save him, a task that is easier done than described.

As you begin the 15-minute game, the movement of concentric rectangles on the screen gives you a sensation of moving through a tunnel or corridor. At the top of the screen is displayed the year through which you are currently traveling. Also visible is a small watch-shaped image that you can move around the perimeter of the screen with the joystick.

The screen is divided into 11 wedges, each of which is assigned a category name—air and space, household items, architecture, communication, political leaders, et al. Each event in the time machine falls within a given year in one of the categories. For example, Lenin is in the political leaders category in 1918 and gymnastics falls under fun and games in 1776.

As you move your scanner around the perimeter of the screen, it passes through the various categories, but to find out which segment represents which category, you must wait until the machine passes a year in which there is an event for the category in which you are waiting.

When you pass through a year in which a given event occurred, the time machine stops and displays the name of the event along with the year. In addition, at the bottom of the screen, you see the name of the event to which Anacron is currently clinging.

SOFTWARE EVALUATION

Betsy Staples

You must then decide whether that event is chronologically ahead of or behind the year in which you are, into what category it would fall, and where that category is on the screen. You then move to that category if you know where it is and wait for the years to fly by, hoping that Anacron will be there when you arrive, for he moves about with fair frequency depending on the level of difficulty chosen. Of course, if you have misestimated the year of the event, you may have a long wait.

Got that? Well, we certainly don't blame you if you are now as confused as we were the first few times we played the game. The concept is simple, but the implementation is complex. We found it very difficult to remember where each of the 11 categories was located each time (they change for each new game).

The documentation, a 12-page four-color booklet, does little to elucidate the intricacies of game play. You just have to turn the computer on and watch and experiment until you catch on.

Our inability to describe the program adequately should not deter you from trying or buying it, however. We found

Time Bound

Telly Turtle

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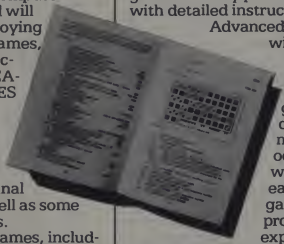
BY ROBERT MAUNDER



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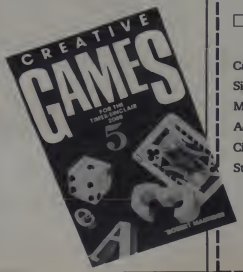

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the game challenging and entertaining, especially at the intermediate difficulty levels—at the higher levels, Anacron moves so frequently that it becomes almost impossible to catch him.

Although the game seems to be designed for play by one person, we found it much more fun to play with a group. If you play alone and find Anacron clinging to an event you can't place, you must simply wait until he moves. With a group, however, even if no member is quite certain of a date, the discussion that takes place each time Anacron moves is quite educational—particularly if the group members are of different ages.

SOFTWARE PROFILE

Name: Time Bound

Type: Educational history game

Authors: Children's Television Workshop

System: Apple, Commodore 64, PCjr

Format: Disk, cartridge, cassette

Summary: Entertaining way to learn historical facts

Price: $26.95 to $39.95 depending on format

Manufacturer:
CBS Software
One Fawcett Pl.
Greenwich, CT 06386
(203) 622-2525

Discussion of the events is also helpful in developing a sense of history and the relationships between and among various historical events. And unlike many games that rely on mastery of facts, the value of *Time Bound* does not diminish with repeated play. As you learn the dates, you simply become better at the game, and young children who have paid attention during past games, can give adults a run for their money.

Hence, *Time Bound* is a good, educational game that the whole family can enjoy. It could also be played by small groups in a classroom setting.

Time Bound is, indeed, unique. It is also fun. We recommend it as a way to enliven the usually tedious memorization of significant dates and develop a sense of history.

CIRCLE 406 ON READER SERVICE CARD

Telly Turtle

The turtle is currently one of the two most popular animals in the personal computer world. The other, of course, is the mouse, and someday we will talk about the role of mice in education. This month, however, we will concentrate on turtles—or, more accurately, one particular turtle.

Telly Turtle is the star of the program that bears his name. Your job is to choreograph his performance.

You start with a clean slate; the upper three-quarters of your screen is blank. At the bottom of the blank area are the commands from which you can choose to make Telly do your bidding. Telly himself, a rather blocky, abstract rendition of a turtle, appears in the middle of the blank screen (his yard).

To make Telly move about on the screen, you need only be able to use a joystick or four directional keys on the keyboard. On the first level, he can be made to turn left or right; move ahead; draw in yellow, green, or red; lift his crayon so he can move without drawing; erase; and produce sounds.

Level one is actually quite primitive, offering only slightly more control than common doodling programs. It is intended to serve as an introduction to Telly's world, and does, in fact, provide more than adequate challenge for young children.

On level two, you find the same selection of commands, but now you must specify a number after each command to let Telly know how far or for how long he should do each thing. This is where you can really get involved. It is challenging for children and adults alike to guess and remember how many units (not degrees) Telly must turn to make a right angle or to reverse his direction, to plan a drawing so that it fits in Telly's yard, to create intricate patterns as they become familiar with the commands.

The third level adds the ability to program a sequence of commands for Telly to execute. This is cumbersome at first, and we quickly became adept at using the large red X that cancels a command. Soon, however, we had our reptilian friend zipping all over the screen.

The programming process becomes even more complex and rewarding on level four where you acquire the ability to repeat commands and sections of your program, specifying where and how many times you want them to occur. You can also control the speed at which Telly executes your program, and you can save your programs on disk or cassette.

Logophiles would be talking about procedures by this time, but *Telly Turtle* eschews all jargon until the end of the documentation booklet where we find a list of 13 computer terms and how they relate to the program.

Documentation

The 24-page small format documentation booklet is very well done. It leads you step-by-step through the illustrations that introduce the features of each level and then turns you loose with a few suggestions for beginning turtle drawing projects. At the end of each section there is a list of commands introduced on the current level accompanied by a simple explanation of what each does.

Students of all ages will find themselves programming in no time.

The last section of the booklet is for "Telly Turtle Tutors" and offers some of the philosphy behind Logo in general and this program in particular. It suggests exercises, but admonishes adults to resist the temptation to offer too much guidance.

In the section entitled "What Have I Learned?" we find a list of what might otherwise be called the educational objectives of the program: problem solving, logical thinking, organization, and sequencing. We are also told that children confront "frame of reference" in the program: "a right turn to Telly may not look like a right turn to you."

Summary

Telly Turtle is an unusually well executed package. The program is well conceived, challenging, entertaining, and rewarding. We like the way it exercises problem solving skills in an environment that fosters computer literacy and encourages children to program.

Younger children will need the help of an adult to read the instruction booklet, but those who can read should have no trouble working their way through the lessons. Students of all ages will find themselves programming in no time. ■

CIRCLE 407 ON READER SERVICE CARD

SOFTWARE PROFILE

Name: Telly Turtle

Type: Educational program

Authors: Bob Stewart
with Radia Perlman

System: Commodore 64; Atari

Format: Disk or cassette

Summary: An easy, playful introduction to programming

Price: $34.95

Manufacturer:
Carousel Software, Inc.
877 Beacon St.
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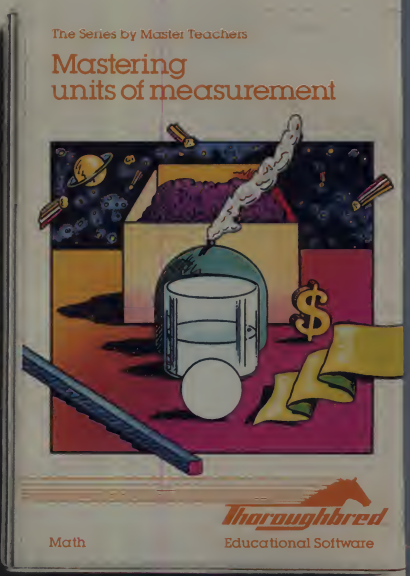

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CIRCLE 187 ON READER SERVICE CARD

More Excitement For Thinking Adventurers

SOFTWARE EVALUATION

Monte Schulz

Fantasy/adventure is the single most popular genre in computer games. There are several reasons for this, but the most prominent is creative flexibility. In a fantasy context anything goes. When a new world is created for viewing on a CRT, its laws are subject only to the whims and desires of the writers/programmers who have conceived it.

However, not all of these computer generated fantasy worlds are created equal. Some adventures violate the integrity of their own premise for cleverness sake (introducing, for example, "force fields" in a traditional Cold War spy thriller), while others choose simply to settle for a re-hash of someone else's game (find your way into the Great Caverns, map the maze, kill the 101 guardian monsters, steal the gold, and get out).

In some cases, the differences between good games and better ones lie in the programming. More often than not, however, the differences are simply the result of good writing versus bad, of a creative imagination versus an imitative one. Today, there are very few truly excellent fantasy/adventure games in the software marketplace, but the ones that do exist are so well conceived and so imaginative, that they tend to be engrossing in a way that almost transcends mere gaming. Perhaps not so coincidentally, the people at Infocom, authors of the fantasy trilogy *Zork*, have written roughly half of these wonderful programs.

Sorcerer, the second installment in the *Enchanter* trilogy, carries Infocom's Fantasy Series forward again with another well-conceived and executed storyline. Like the first *Enchanter*, *Sorcerer* turns on the idea of a quest. All that is known for certain this time is that Belboz, leader of the Circle of Enchanters, has disappeared and that event is linked somehow to a demonic presence called Jeearr.

The plot of *Sorcerer*, therefore, is more detective tale than mere adventure. It is a mystery in a fantasy setting that must be unraveled one small step at a time. Clues abound in the wilderness of the Great Underground Empire, but as in any good mystery, determining just how they fit the larger puzzle of the game remains one of the challenges.

Yet, the mystery element is only one of the things that makes this a special game. In many ways, *Sorcerer* is wilder and more

colorful than its predecessor. There are more rooms of a greater variety, and they are inhabited by a wonderful collection of fantastic and bizarre creatures each of which must be dealt with to survive the game.

Actually, *Sorcerer* provides so much to see and do that it seems less than half of the game is directly connected with the locating of Belboz. There is even an old amusement park tucked away in an obscure corner of the Empire. If that sounds a little too frivolous, there is always King Duncanthrax's Maze of Glass—a three dimensional 27-room cube of transparent walls constructed as a plaything in the early days of the Great Underground Empire to torture the unfortunate. An inattentive and unimaginative enchanter will be hard pressed to survive for very long in its interior, yet traversing its many passageways is mandatory to solving the game.

Sorcerer is a uniquely difficult game to play. Rather than providing the continuity of bafflement found in the first *Enchanter*, it turns on several extremely tough puzzles built into an otherwise (seemingly) simple game. In other words, you can play for hours just wandering around having a good time, only to stumble into a situation where you become stuck without a clue as to what should be done next. Remember: this is a game for the thinking person.

What is nicest to see is that Infocom believes in its own fantasy world. There is a consistency both in mood and detail about are now beginning to dovetail and the picture takes shape.

The writers at Infocom have made "real" their own realm of fantasy in fiction, and by doing so, are granting those of us who play these games a share in that creation. Who can say where it will all end? One thing is certain: years from now when critics of interactive computer literature discuss the origins of the genre, there will be little doubt that it had its most colorful and entertaining beginnings at Infocom. ■

allowing each game in the Fantasy Series to build on an already conceived and established groundwork. In *Sorcerer*, Steve Meretsky adds to the foundation laid by *Zork* and *Enchanter* authors Marc Blank and Dave Lebling by further expanding the geography and legend of the Great Underground Empire. Like an immense jigsaw puzzle of characters, places, and events, the pieces previously scattered

Infocom believes in its own fantasy world.

SOFTWARE PROFILE

Name: Sorcerer

Type: Text adventure

System: Apple, Atari, IBM PC, NEC PC-8000 and Advanced Personal Computer, TRS-80 Models I and III, Commodore 64, Osborne 1, TI Professional, and any CP/M-based system with 8" disk drive

Format: Disk

Summary: One of the finest fantasy/adventure programs available for the micro.

Price: $49.95; $59.95 for CP/M

Manufacturer:
Infocom Inc.
55 Wheeler St.
Cambridge, MA 02138
(617) 492-1031

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*It works with all the following word processors, with owners of trademarks indicated in parentheses: DOS 3.2 & DOS 3.3: AppleWorks (Apple Computer, Inc.); Bank Street Writer, Format II (Broderbund); HomeWord and Screenwriter (Sierra On-Line, Inc.); Word Handler (Silicon Valley Systems). CP/M: Wordstar (Digital Research Corp.); Microsoft Word (Microsoft); PFS: WRITE (Software Publishing, Inc.); and others. All features are not available with CP/M. PFS: WRITE and Word Handler.

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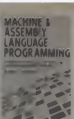

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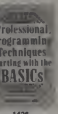

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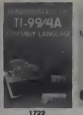

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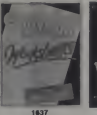
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Some people think we're a little crazy to go to all that trouble. After all, do you really need a diskette that can make one read/write

oduces thing to bout.

pass on every track, every hour, every day for the next 200 years?

Not really.

But now that you know a 3M floppy can do it, you can relax.

And worry about other things.

Like who stole your lunch from the office refrigerator.

One less thing to worry about.

CIRCLE 154 ON READER SERVICE CARD

Women's Ware

Elizabeth B. Staples
39 E. Hanover Avenue
Morris Plains, NJ 07950

Dear Mom,

Guess what! Someone has finally created a line of software for us--women, that is. Oh, I'm sorry; I should explain that software is what makes a computer do whatever it is you want it to do. You know, those little flat black things that Dad slides into the front of the cursed machine when he wants it to process words or perform some other miraculous feat.

Anyway, these programs are called Women's Ware, and we'll feel very comfortable buying them because they look just like pantyhose hanging on their cute little rack (I'm planning to save the little white hangers for Jason's T-shirts). You know how intimidated we women are by anything that doesn't relate to clothes or food.

The really great thing about these programs is that Neon Software, the manufacturer, has had the guts to call a shallot an onion. They know that the feminism of the past decade is just so much pigeon poop. They realize as you and I do that we really are the shallow, helpless wimps men have known us to be for centuries.

The folks at Neon know that we can't possibly cope with computers the way men do. They know that women and computers are like melted Crisco and lemonade. They have allowed us to come out of the closet and acknowledge our stupidity and ineptitude. What a relief!

It's almost as if they had been listening to our conversation during the commercials between the soaps last week. They know that we are mystified and intimidated by the activity that takes place in dens and basements of our split-level tract homes. And they have come to our rescue.

To give you an idea of just how terrific these programs are, let me give you a brief description of a few of them. My favorite is Recipe. You know how you keep your favorite recipes in that old loose leaf binder Martha and Penny made for you in Sunday School and how you always make notes right on the page with each recipe so you won't forget that Billy hates asparagus and stuff like that? Well, I used to have a book like that, but no more.

Now I keep my recipes on the Women's Ware Recipe program. It allows me to type in my recipe along with a category heading (like Dessert--my favorite!). I can then store the recipes in the computer instead of that old fashioned book or file box. When I want a certain recipe, I just run downstairs to Dick's computer room, wait for the computer to do its "self-test," load what they call DOS, load my Recipe program, ask it to find the recipe I want, and print it out on the printer. Isn't that great! It makes me feel so modern! And it helps me fill in my spare time, so I don't feel so guilty about sitting around the house all day.

The other program I like a lot is called Checkbook. You know how Dick has always said that only a nitwit would use a computer program to do something that could be done easily with pencil and paper? Well he's right. I just love balancing my checkbook by computer. And I can imagine how much fun it would be if Dick would let me pay the bills.

The other programs in the series are just as neat as Checkbook and Recipe. I also have Freefile, which allows me to keep track of such important stuff as when I last watered my houseplants; Directory, which is a lot like a file box; and Calendar, which lets me list the kids' activities tidily on the computer instead of on that unsightly calendar we used to have on the kitchen wall next to the telephone.

SOFTWARE PROFILE

Name: Women's Ware (assorted titles)
Type: Home applications
System: IBM PC, PCjr
Format: Disk
Summary: A giant step backward for womankind.
Price: $49.95 and $79.95
Manufacturer:
Neon Software
55 High St.
Middletown, CT 06457
(203) 346-6322

409 ON READER SERVICE CARD

I didn't get the program called Budget, because Dick is the one who does important things like that. He gives me my allowance each week; all I have to do is spend it--and I sure don't have any trouble doing that!

I sure am glad that Women's Ware doesn't have one of the those programs for "word processing." I know that would be too hard for me. Dick uses it all the time, and he says that the girls in his office can do it too, but I can't even imagine what I would do with a program like that--I'll stick to checkbooks and recipes, thank you.

The programs themselves are real easy to use, you just use those keys with the F's on them on the lefthand side of the keyboard to choose what you want to do. Then you type the information you want right on the screen that appears. The only problem I had was that the F10 key sometimes means "proceed" and sometimes means something like "stop this program and do something that makes it necessary to load DOS and the program all over again." Silly me, I kept forgetting what it meant which time, so I had to spend a great deal of time messing with those dumb disk drives.

The other thing I found strange was the fact that some of the screens take up the whole screen and some of them only use half of it, and when you are using only half of the screen, the stuff that was on the other half of the big screen stays there. Dick says this might have something to do with the fact that we don't have to learn computer adapter." He says it would have been easy for the programmer to have fixed it so we poor folks who don't have color graphics adapters could have used it too. But I'm not complaining, it's easy to overlook one small shortcoming in such a wonderful collection of programs.

Oh, I almost forgot to tell you about one of the best parts of the Women's Ware line: the instruction book. Computer people call it "documentation," but that's such a big word, and Marie, the woman who wrote the booklets, says we don't have to learn computer words. Anyway, when you read the book, you feel just like Marie is talking to you. She tells you cute little things about her family and makes you feel like she is just as stupid as you are.

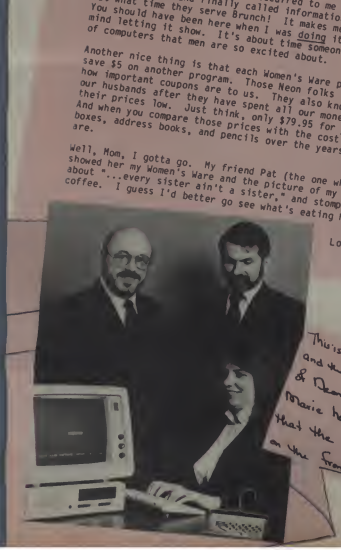
For example, in the Filebox booklet, she starts out: "Hi, it's me--Marie. Let me tell you about my great ideal. It occurred to me this afternoon after I had checked through a pile of papers and finally called information for the number to call a restaurant to find out what time they serve Brunch! It makes me lose my breath just to tell you all that. You should have been here when I was doing it!" Marie really is a dope, and she doesn't mind letting it show. It's about time someone like her got involved in this secret world of computers that men are so excited about.

Another nice thing is that each Women's Ware package comes with a coupon that lets you save $5 on another program. Those Neon folks really do understand women, and they know how important coupons are to us. They also know how hard it is for us to get money from our husbands after they have spent all our money on computer hardware, so they have kept their prices low. Just think, only $79.95 for Filebox and $49.95 for the other packages. And when you compare those prices with the cost of thousands of file cards, little metal boxes, address books, and pencils over the years, you can see what a bargain they really are.

Well, Mom, I gotta go. My friend Pat (the one who works) just stopped over and when I showed her my Women's Ware and the picture of my new friend Marie she muttered something about "...every sister ain't a sister," and stomped into the kitchen to get a cup of coffee. I guess I'd better go see what's eating her.

Love,

Becky



This is Marie with her husband (r.) and the executive vice president of Neon Software. Notice that Marie has not yet figured out that the important stuff is on the front of the monitor.

Learn Chess from the Masters

Cyberchess

CREATIVE COMPUTING

SOFTWARE EVALUATION

C. A. Johnson

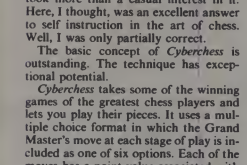
I would hate to guess how long ago it was that I played my first game of chess. I do remember that the game ended in a draw, because neither my opponent nor I knew how to administer a checkmate. We moved pieces on the board until we got tired of it and called the game off.

Ever since, I have continued to try to improve my game. When chess playing computer programs became available for my TRS-80, I bought them and played them. Some, I found too easy; others took too much time to complete a game, although I enjoyed getting beat by them.

When I encountered *Cyberchess*, I took more than a casual interest in it. Here, I thought, was an excellent answer to self instruction in the art of chess. Well, I was only partially correct.

The basic concept of *Cyberchess* is outstanding. The technique has exceptional potential.

Cyberchess takes some of the winning games of the greatest chess players and lets you play their pieces. It uses a multiple choice format in which the Grand Master's move at each stage of play is included as one of six options. Each of the moves has a point value associated with it. When you select the correct move, you are credited with one point. When you select any of the other moves, you may lose as few as 0 points (if the analyst considers that move equal to the Grand Master's) to as many as six points. Some moves are considered so bad that recovery is impossible, and you lose immediately.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LEVEL ADVANCED ..... POINTS : 1
1. P-K3 WHETHER WHITE ADVANCE ANY UP ARE CLOSING OFF QU
2. B-B3 DOESN'T APPLY THE MAXIMUM PRESSURE POSSIBLE
3. O-O K SAFETY
4. B-Q2 PASSIVE DEVELOPMENT FOR B
5. P-QR3 =1
6. B-Q2 BRINGS B TO STRONG QR4 SQUARE AND STUDY UP KB
PRESS KEYS # TO DISPLAY ANALYSIS OR PRESS SPACE TO GO ON

Chess master's analysis of all available moves.

There is an instructional mode, in which there is no time limit imposed on your play and some notation is available for each of the wrong alternatives. There are also two modes of tournament-timed play and two variations of speed play available. For learning, the instructional mode is the one to use.

Cyberchess requires that you use a chessboard and a set of chessmen. To start, the first few moves are given, since they are standard openings. At this point, the board is displayed so that you can check the position of your pieces on your board. After each tenth move, the board is displayed again.

You make the moves for one set (designated by *Cyberchess*) and the opponent's response is given to you immediately. Before you go on to the next move, you may select any of the alternatives for the analysis or comment.

Of course, there is value in the analyses provided by *Cyberchess*. Careful study of the position at each move can provide valuable insights into the game, if all levels of difficulty are explored. I firmly believe that the benefits to be gained by using *Cyberchess* are realized by studying the moves the Grand Masters do not make and checking the program's analysis of those moves. If you can learn to understand why a given move in a sequence is bad, you will improve your chess by reducing the number of bad moves you make.

If you do not know anything at all about chess, *Cyberchess* will be of little or no value to you. It will not teach you how each of the pieces moves or any of the principles of good position play or long range strategy. *Cyberchess* assumes that you already know how to play.

If you can learn to understand why a given move in a sequence is bad, you will improve your chess by reducing the number of bad moves you make.

At the beginning of each game, it presents a statement that is supposed to help to guide you through the moves. In fact, it tells you something of what happens in the game, but it does not (and probably cannot) tell you what the early rationale of the master was which determined the line of play he chose.

Good chess players generally confine their moves to traditional lines, paying attention to maintaining good position, until they find (or think they find) a weakness in their opponent's position. They then put pressure on the weak spot until a major weakness develops.

In the *Cyberchess* games I played, the

real reason for deviation from the traditional (proven) sequences is not known. Each move is made and evaluated in terms of short term goals. The objectives of the masters are displayed solely on the basis of results. For my style of play, this is not enough. I need to know *why*!

Once you have learned some of the fundamentals of good play, *Cyberchess* can help to develop some positive insights into the game. However, it does that through repetitive play through all levels of difficulty and requires a thorough exploration of the reasons for not selecting the bad moves.

I suppose that everyone will find some disagreement with the expert who provided the comments and evaluations of the various moves. However, I found that the approach used in *Cyberchess* kept my concentration level up and forced me to study the score to a greater degree than I would have in just reviewing the game on my own with the cryptic notation generally supplied as comments by most chess analysts and editors.

SOFTWARE PROFILE

Name: Cyberchess

Type: Chess tutor

System: 32K TRS-80, 2 disk drives, IBM PC, XT & compatibles, Apple II, C-64

Format: Disk

Language: Machine

Summary: Excellent way to improve your game

Price: $29.95

Manufacturer:
Cyber Enterprises
17527 Antonio Ave.
Cerritos, CA 90701
(213) 926-6021

Basically, I like *Cyberchess* and plan to use it frequently. It does reduce the tendency toward haphazard play.

My present exposure to it was limited to the system package, which consists of the *Cyberchess* system program and four games. Two of the games were amateur class and two were professional class. All used different openings.

The list of additional game packs to be used with the program (four games to the pack) groups the games according to difficulty (amateur or professional). However, the list did not include any pricing information. ■

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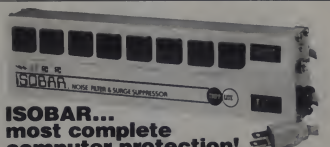

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Dnieper River Line

If you have ever envisioned yourself as a field commander of an assortment of Wehrmacht troops, few in number and braced for a massive Soviet offensive, then *Dnieper River Line* (*DRL*) may be for you.

DRL simulates a fictitious series of combat scenarios between the German Army Group South and an unidentified, but prodigious, Russian force in 1943. The game includes a mounted mapboard, approximately 300 counters representing the various types of units available to both sides, a 16-page rule booklet, and a cassette (32K) or disk (48K). The computer assumes the Russian side and functions essentially as an information retrieval/analysis bank by providing such necessary data as combat results, German status reports, Russian troop movements, and the effects of artillery barrages.

SOFTWARE PROFILE

Name: Dnieper River Line

Type: Wargame

System: 32K TRS-80 Model I & III, Apple II+, Pet, C-64; 48K Atari.

Format: Cassette or disk.

Summary: Authentic, challenging military simulation

Price: Cassette, $25; Disk, $30

Manufacturer:
Avalon Hill Game Company
4517 Harford Rd.
Baltimore, MD 21214
(301) 254-5300

SOFTWARE EVALUATION

Brian J. Murphy and Daniel Campagna

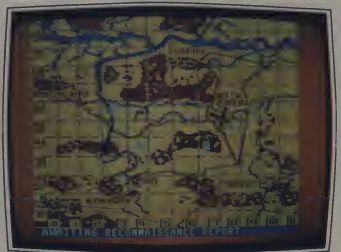
To understand the mechanics of this design, keep in mind that it is directed primarily at wargamers. As a result, *DRL* is bereft of the visual glamor of arcade games and the more sophisticated map-scrolling displays found in some games. The map and counters in *DRL* are, in a sense, a substitute for hi-res graphics. Divided into 144 geographic squares with X,Y co-ordinates, the map contains six objective areas each worth a varying number of victory points. It is the German player's task to defend one or more of these objective areas, depending on the scenario and level of complexity chosen.

The computer offers you three German orders of battle, called Status Reports. After selecting a particular order of battle, which typically includes 9 to 12 assorted units, you must enter the starting location and combat mode of each unit. There are three combat modes: assault, mobile and static, each of which affects the ability of a unit to observe and report Russian troop movements. An entrenched Assault Infantry unit, for example, is less able to monitor the disposition of Soviet troops operating beyond its immediate vicinity.

To assist you in preparing a stalwart defense, minefields and garrison companies are allocated to objective areas and likely avenues of enemy attacks. These elements are meant to slow down the Russian advance, particularly in the case of Soviet partisan infantry who appear behind your front line. The computer, meanwhile, assembles up to 22 Russian units for the initial offensive across the Dnieper River, and the battle begins.

DRL is a finely balanced game with a slight edge going to the computer. Outnumbered and spread thin, you must construct an elastic front line capable of delaying the enemy offensive until the key objectives are identified. At that point, powerful reserves in the form of SS Infantry and Heavy Panzers are committed to the contest.

Despite the sophisticated ease of this



Dnieper River Line C-64 version.

design, the game does have some shortcomings worth noting. German counterattacks, for example, rarely succeed. This reduces the German role to that of the passive defender. Also, tactical options are few. Fighting withdrawals, infiltration, and diversionary sorties would enhance the German ability to retaliate. Lastly, the absence of any graphics, sound, or real-time ingredients makes *DRL* more sedate than necessary. Wargamers yearn for the unpredictability of simulated combat as a way of testing their judgment under pressure against the impartial logic of the computer. *DRL* is too abstract to produce this effect. It needs, in other words, more chrome, random variables, and time constraints to upgrade it from a very good game to an excellent one.—*DC*

DRL is a finely balanced game with a slight edge going to the computer.

CIRCLE 411 ON READER SERVICE CARD

North Atlantic '86

It is 1986, and the Warsaw Pact countries have invaded and conquered Western Europe. The NATO armies have retreated across the channel to Britain which was swiftly surrounded by hostile forces.

That is the situation as you assume command of all NATO land, sea, and air forces in *North Atlantic '86*, the latest wargame by Strategic Simulations.

The NATO player's objectives are simple: to keep Britain supplied and the air group at Scapa Flow active and to retain control of Iceland and the Faroe Islands. The Soviet player (or the computer in solitaire mode) seeks to capture Iceland and the Faroes, cut off Britain from all supplies and bombard the NATO air/sea base at Scapa Flow.

Mechanics of Play

The game begins with both sides organizing task forces. In the "Task Force Adjustment Phase," players select ships for combat, bombardment, transport and submarine warfare. You can also examine the speed, damage levels and endurance of forces at sea as well as the strength of your land and air forces and the number of combat ships sunk on both sides.

In the movement phase you are allowed to move each task force individually in any of eight directions. You may also dock a force, stop it or turn on or off its radar and sonar search function (turning off the radar makes the task force harder to find and turning it on makes it easier for the force to spot hostile forces).

In the air movement phase you assign planes to long and short range CAP (combat air patrol) to locate enemy units. Then you get a map display spotting all sighted enemy forces. Task forces in range can launch surface-to-surface missile attacks with results revealed later on in the Combat Resolution phase of the turn.

Any enemy within range can be targeted for air strikes which can be launched against land or sea objectives. Planes attacking sea targets with missiles can launch at extreme "standoff" range, making enemy missile or fighter interception unlikely.

On land you can choose to attack contested locations such as the Faroes and Iceland. You have five levels of combat intensity from which to choose. The more intense the attack, the higher the casualties will be (on both sides) and the more likely it is the attack will succeed.

North Atlantic '86.

Combat is resolved automatically. Calculating the odds, the computer displays the results of missile firing, then the outcome of surface and submarine combat and the results of the land battle.

Winning the game is a matter of selecting the right ships for the right job. Put strong missile defenses around your cargo ships and carriers. Put heavy guns in the bombardment groups. Do not mix nuclear subs with non-nukes (the non-nukes slow up the rest). Also keep land based troops and air forces supplied so morale (and victory points) remain high and so you can continue to fight. This places a lot of emphasis on the safety of your transport ships.

The computer awards victory points for the possession of the Faroes and Iceland, for ships sunk, and for NATO morale (which is maintained by supplies).

North Atlantic '86 is the biggest wargame designed for a home computer to date.

Each island taken by the Soviets and every turn during which supplies fail to reach Scapa Flow transfers victory points from the NATO to Soviet columns.

North Atlantic '86 is the biggest wargame designed for a home computer to date. The size of the battlefield, the all-embracing scope of the forces involved, and the time and detail involved are staggering. This game should have appeal for veteran wargamers, who will find it a challenging test of their skills, and for first-time wargamers, who will find it surprisingly easy to learn.

Gary Grigsby has created an interesting and engrossing game and a very realistic simulation. Given the basic premise of *North Atlantic '86*, that is a most disturbing thought.—*BJM* ■

CIRCLE 412 ON READER SERVICE CARD

SOFTWARE PROFILE

Name: North Atlantic '86

Type: Wargame

Author: Gary Grigsby

System: 48K Apple

Format: Disk

Language: Applesoft

Summary: Superb "monster"-sized game simulating a future NATO-Soviet naval war.

Price: $59.95

Manufacturer:
Strategic Simulations Inc.,
883 Stierlin Rd.
Building A-2000
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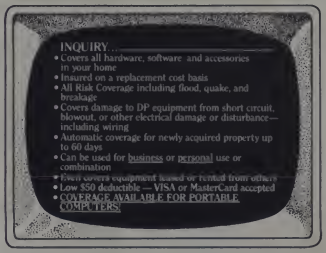
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Games Computers Play

SOFTWARE EVALUATION

John J. Anderson, Russ Lockwood, Brian Murphy, Owen Linzmayer, and Steve Williams

As personal computer hardware becomes more capable and more sophisticated, so, too, does the software that runs on these machines.

Just a few years ago we were satisfied with primitive lunar landers, simple adventures, and X's and O's on a simulated football field. Now we expect sophisticated sound and graphics to accompany the complicated scenarios and demanding skill levels of the games we play.

In the following potpourri of game reviews you will find a sampling of the editors' current favorites for a variety of popular machines.

Touchdown Football

Touchdown Football

Searching for a playable football game is akin to searching for the holy grail. False hopes loom on every horizon, and disappointment becomes a constant companion. At the magazine, we have tried just about every football game available for every computer and game machine—of today as well as yesteryear.

Our Vectrex *Blitz* phase is legend.

Touchdown Football passes all the mandatory tests for a playable football game: it takes place in real time; makes use of animated color graphics to depict the playfield, players, and ball; allows play against the computer or a human opponent; allows you to feel entirely in control of your team; simulates the rules and feel of football with veracity and style; and allows playing skills to grow at a slow but steady rate.

And *Touchdown Football* offers more than this. Its most startling feature is that it talks, announcing scores, turnovers, and penalties in a natural and entirely intelligible speaking voice.

But even without sound, the game is a triumph in football programming. Rather than needing a laminated card or crib sheet, you can preview all your options during selection using on-line documentation. Two windows appear at the top of the screen—one for offense, one for defense. Once you have previewed your selection, you lock it in without indicating to your opponent your formation, receiver patterns, or blocking call. You can even put a man in motion or change the call from the line of scrimmage.

Screen graphics are for the most part excellent. Though playfield scrolling is distractingly choppy, we are sure this is a limitation of the PCjr that was impossible to surmount. Depiction of the players themselves is artful and witty. They trot amusingly, heavy in pads and helmets, arms pumping away. During a tackle, they fly in all directions. After a touchdown, the scorer indulges in a little victory dance.

The "feel" of a football simulation is all-important, as it is for a flight simulator. *Touchdown* feels pretty good—a tad mushy at times, like running in a dream, with your feet in molasses. But the sequence of play is smooth and looks quite a bit like a pro game on TV.

Without qualification, however, *Touchdown* is the best football game available for the IBM and among the very best efforts we have seen from Imagic. With a little more polish it can be the best football simulation on the market today.—*JJA*

CIRCLE 413 ON READER SERVICE CARD

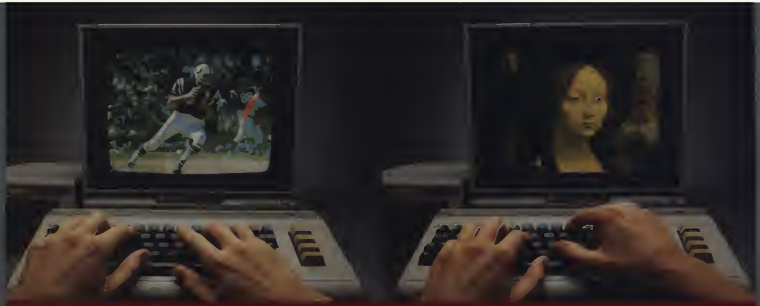
SOFTWARE PROFILE

Name: Touchdown Football
Authors: Greg Klein, Mike Becker
Type: Real-time football game.
System: IBM PCjr
Format: Disk
Summary: Among the best we've seen.
Price: $34.95
Manufacturer:
Imagic
981 University Ave.
Los Gatos, CA 95030
(408) 399-2200

Raid on Bungeling Bay

The evil Bungeling Empire is at it again, this time with a vengeance. You outmaneuvered them in *Choplifter*, you outwitted them in *Lode Runner*, and now you must outshoot them in *Raid on Bungeling Bay*. The gears have been set in motion, and the omnipotent Empire war machine has begun to build weapons of destruction—your destruction. You pilot a heli-craft, a heavily armed helicopter which looks as if it has just flown off the set of "Blue Thunder." Your mission is to slip into Bungeling Bay and destroy the six war factories that are located on islands scattered in the Bay.

Raid on Bungeling Bay is a single-player arcade game for the Commodore 64. If you don't have a joystick, you can control your heli-craft using the keyboard, though I am sure that you will find it more enjoyable to use a joystick. The graphics of *Raid on Bungeling Bay* push the animation capabilities of the Commodore 64 to their very limits.



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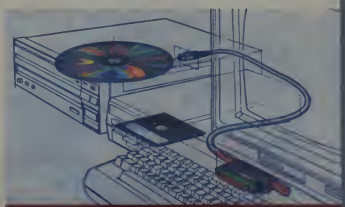

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Raid on Bungeling Bay

Stellar 7

At the beginning of each game, or any time you get killed, your heli-craft appears on the deck of your aircraft carrier, which is drifting off-shore. The heli-craft is armed with an unlimited number of missiles and can hold a maximum of nine bombs at any given time. To replenish your supply or repair damage, you must return to the carrier.

The screen depicts an aerial view of the bay with your heli-craft always located in the center of the display. If you move to the right, the terrain below scrolls into view. There are more than 100 screens that wrap-around at both top and bottom, so you never get that frustrating feeling of running into "the edge of the universe."

Several islands are located in the bay, only six of which are home to war factories. The others may be deserted, or populated with such devices as revolving radar dishes which help the enemy aircraft find you. Factories are usually well protected by anti-aircraft guns and roving tanks—both will keep you on your toes.

SOFTWARE PROFILE

Name: Raid on Bungeling Bay
Author: Will Wright
Type: Arcade
System: Commodore 64
Format: Disk
Summary: Blows *Choplifter* away!
Price: $29.95
Manufacturer:
Broderbund Software
1938 4th St.
San Rafael, CA 94901
(415) 479-1170

Though I have never flown a helicopter, I am sure that after playing *ROBB* I know how it feels to be the controls of a flying war hawk. The movement is excitingly realistic:—trying to outrun an enemy heat-seeking missile, you throw the stick forward, opening up to full throttle and pushing the heli-craft to its design limits.

This is the kind of first person realism that makes arcade games such a powerful force in the entertainment field. This is the kind of first person realism that is going to make *Raid on Bungeling Bay* one of the all-time great home computer games. —*OWL*

CIRCLE 414 ON READER SERVICE CARD

Stellar 7

Stellar 7 is an Apple variation of Battlezone, a coin-op game with startling 3-D perspective in which the player controls a tank and must engage hostile enemy forces in a barren vector-graphics wasteland. Battle zone was originally introduced strictly as an arcade game, but the United States military was so impressed that it commissioned Atari to develop an advanced version of Battlezone to be used as a simulation/trainer for tank commanders. While restricted by the slower, less precise raster graphics of the Apple, *Stellar 7* is an excellent adaptation of the original Battlezone.

Your long range objective in *Stellar 7* is to destroy the Supreme Overlord of the Arcturan Empire. Before you get a chance to do this, however, you must do battle in seven unique star systems—not an easy task. On each system there is a warplink that can transport you to the next system, but this materializes only after you have defeated an enemy assault wave consisting of numerous tanks, jets, homing mines, and stationary cannons.

To aid you in destroying the enemy forces, your tank is equipped with several nifty devices, the most useful of which is your thunder cannon. Each enemy unit requires at least one direct hit from your cannon before it is destroyed, and some can absorb several shots before exploding.

The thing I love about *Stellar 7* is the realism provided by the three-dimensional perspective—you don't have that detatched, third person feeling, but rather, it is as if you are actually within the computer-driven world.

Stellar 7 has everything we have come to expect in a contemporary computer game. It has the useful pause key, a sound toggle, and a high score chart that is updated and saved permanently to disk.

Stellar 7 is much more than just an adaptation of Battlezone. This Apple game has a zoom lens, an inviso cloak, protective shields, warplinks, fuelbays, and a host of worthy opponents that will keep you at your computer for many, many

SOFTWARE PROFILE

Name: Stellar 7
Author: Damon Slye
Type: Arcade game
System: 48K Apple, C-64
Format: Disk
Language: Assembly
Summary: Excellent adptation of Battlezone
Price: $29.95
Manufacturer:
Software Entertainment Co.
537 Willamette St.
Eugene, OR 97401
(503) 342-3495

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CONVENIENCE

How many times have you started to work with a frequently used program, only to find that you have mispieced the disk, or worse, had the disk damaged, or the dreaded "I/O ERROR" message flash on the screen. With the quikLoader, these nightmares can be a thing of the past. Frequently used programs are available *instantly* when you need them, without having to look for the disk, or hoping that the lengthy disk loading procedure goes smoothly.

PROGRAMMING EPROMS

Putting your own programs on the quikLoader is easily done, using a separate EPROM programmer, and the instructions that we supply. For APPLESOFT, INTEGER, or single machine language files, you simply take an "image" of the program, and put it into the working array of the programmer. Add a few bytes for the overhead and catalog, and instruct the programmer to "burn" the EPROM. Plug it into the quikLoader, and your program is now **instantly** available to be cataloged, loaded, or run. No programming knowledge or experience is necessary to do this. You will need experience if you want to save copy-protected or complex programs. The amount of experience necessary depends on the complexity of the program.

COMMERCIAL PROGRAMS

If you have a program that is valuable, it will become **more** valuable when it is instantly available to you. SOUTHERN CALIFORNIA RESEARCH GROUP is actively seeking licenses from software publishers to allow their popular programs to be made available for the quikLoader. Independent authors are encouraged to write programs suitable for the quikLoader. If the author wishes, we will market the program (with appropriate royalties), or the author can take care of all marketing. In either case, we will make known to our customers the availability of these programs.

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We are currently licensed to sell two very popular programs on PROM. **DOUBLE—TAKE** by BEAGLE BROS., and **COPY][PLUS** by CENTRAL POINT SOFTWARE. The introductory price for DOUBLE—TAKE is $45.00. This includes the program exactly the same as you would buy it at your dealer for $34.95 (including disk and documentation), and a programmed 2712B EPROM (worth about $25.00). COPY][PLUS cost $65.00. This includes the original program (worth $39.95) and two programmed 2712B's. More commercial programs are now in the works.

CIRCLE 188 ON READER SERVICE CARD

MEMORY CAPACITY

The quikLoader has eight sockets for EPROMS. These sockets can accommodate the standard 27XX series of EPROMS. Types supported are the 2716, 2732, 2764, 27128, 27256, and 27512. These types can be freely intermixed. The memory capacity of the quikLoader depends on the EPROMS used. For example, the 2716 can hold 2K of programs, and the 27512 can hold 64K. (Frankly, the current costs of the 27512 is prohibitive, but should come down drastically in the next year.) At this writing, the least cost-per-bit is provided by the 2764, which can hold an 8K program. Using these "chips", the quikLoader bcomes a 64K ROM. Using larger capcity EPROMS allows it to become a 128K, 256K, or even a 512K card. If more memory capacity is needed, the quikLoader operating system supports multiple quikLoaders.

INCREASED DISK CAPACITY

Since DOS is loaded from the quikLoader every time the computer is turned on, it is not necessary to take up veluable disk space with DOS. This will give you more then 5% additional space for programs and data on your disks.

ADDITIONAL FEATURES

The quikLoader has some other handy features. The following keys, pressed In conjuction with "RESET" will perform these actions:

- Z—"Cold boot"
- H—Run "HELLO" program
- D—Boot disk
- X—Enter Mini-assembler
- B—Boot only
- C—Catalog disk
- Q—Display catalog of programs on quikLoader
- M—Drop into monitor.

To run a program from the quikLoader, bring up the quikLoader catalog (Q-reset), and the names of the programs will be displayed, along with an index letter. Pressing the index letter will instantly load and run the program. If you wish to load the program without running it, this option is available to you.

While the quikLoader catalog is being displayed, pressing the "Z" key will toggle the parameter display, showing PROM address, RAM destination address, and length.

Up to 23 programs on the quikLoader can be displayed on the screen at one time. If you have more programs, you may scroll through the catalog (either direction) for up to 256 programs.

The quikLoader is **ideal** for applications requiring a dedicated computer. Your program can be automatically loaded and run at "power-up".

ABOUT THE DESIGNER

The quikLoader was designed by Jim Sather, author of UNDERSTANDING THE APPLE][(forward by Steve Wozniak), published by QUALITY SOFTWARE (21601 Marilla Street, Chatsworth, CA 91311 (818) 709-1721).

REQUIREMENTS

The quikLoader plugs into any slot of the **APPLE][+** or **//e**. If used in a **][+**, a slightly modified 16K memory card is required in slot O. A disk drive is required to save data.

DOS, INTEGER BASIC, FID, and COPYA are copyrighted programs of APPLE COMPUTER, INC licensed to Southern California Research Group to distribute for use only in combination with quikLoader

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other products

SCRG also manufactures these other products for the APPLE computer:

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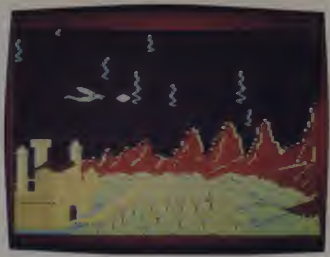


Dragonriders of Pern

hours. Play it once, and you are forever addicted. —*OWL*

CIRCLE 415 ON READER SERVICE CARD

Lazer Zone

In *Lazer Zone*, a C-64 game by Jeff Minter, you are responsible for the defense of Earth when the computer which normally controls two lazer batteries suddenly has trouble telling the difference between 0 and 1. The batteries are located, one each, on a horizontal axis along the bottom of the screen and on a vertical axis along the right edge of the view. Using a joystick, you can maneuver these batteries along their respective baselines.

At the lowest skill levels—there are 31 selectable levels in all—the aliens appear two at a time on the screen and are fairly easy to shoot down. After you have blasted about 20 of each type of ship, however, you are attacked by a new wave of aliens. In each succeeding wave the pattern of their attacks is different, preventing you from settling comfortably into one strategy of defense.

If you let one of the aliens through, it lands on either the horizontal or vertical baseline and tracks your battery until it comes in contact with it, blowing it up. You can prevent this by hitting the F7 function key. This activates the Electro Bolt which destroys any and all aliens that have landed on the two baselines. You start the game with only three and earn an extra bolt each time you destroy an attack wave.

Lazer Zone is a game that draws you in subtly and slowly—and then crushes you in an avalanche of aliens. It is one of those games you can't win; the aliens just keep on coming until you are out of batteries. The challenge is in piling up a large score. —*BJM*

CIRCLE 416 ON READER SERVICE CARD

SOFTWARE PROFILE

Name: Lazer Zone
Author: Jeff Minter
Type: Arcade game
System: C-64
Format: Cartridge
Language: Machine
Summary: Fast moving, multi-level skill game.
Price: $19.95
Manufacturer:
Human Engineered Software
150 North Hill Dr.
Brisbane, CA 94005
(415) 468-4111

Dragonriders of Pern

For two generations after colonists from Earth settled on Pern, they gave no thought at all to the red star that circled their sun. On a close approach of Pern to the Red Star, however, threadlike creatures began to cross space and drop from the star, killing any plant or animal life they touched on Pern.

From a native life form, the Pernese bred flying dragons that could be ridden by humans and used to scorch the Thread to death in the air. As it turned out, the threat of the Thread would come in cycles, sometimes hundreds of years apart. But whenever Thread began to fall, the dragons and the Dragonriders would save the day.

That, in a highly simplified form, is the basis of Anne McCaffrey's Dragonrider novels, one of the most famous science fiction/fantasy series ever, and of the new Epyx fantasy game, *Dragonriders of Pern*.

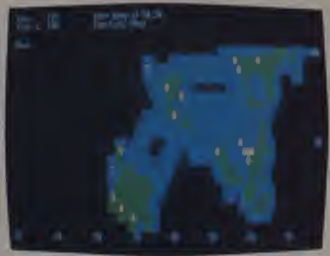
In *Dragonriders* from one to four players can assume the role of Weyrleader (leader of a threadfighting squadron of dragons). Six Weyrleaders are pitted against each other in a struggle for planetary power and influence (the computer will always play the part of two Weyrleaders and can assume the roles of up to five). You must try to convince the various lords of the Holds (where the Pernese live) and Craftmasters (the skilled artisans) that you're the best man to defend Pern against the fall of Thread.

The mechanics of the diplomacy and negotiation required to achieve your goals are not as hard to master as, for example, sixteenth Century Italian court politics—they are only nearly as hard.

In all, there are sixteen Lord Holders and eight craftmasters for you to woo. You have all manner of diplomatic and social tools at your disposal to use in persuading the Holds and Crafts to take your

SOFTWARE PROFILE

Name: Dragonriders of Pern
Type: Fantasy/strategy game
System: 48K Atari; C-64, joystick
Format: Disk
Language: Machine language
Summary: Novel and engaging fantasy game.
Price: $40
Manufacturer:
Epyx Computer Software
1043 Kiel Ct.
Sunnyvale, CA 94089
(408) 745-0700



Empire

Starship Challenge

side. The trick is to use the right tools for the job.

If nothing works in negotiations or alliances, you can always resort to violence and challenge your opponent to a duel.

Another way to influence opinion is to offer your fighting wings wherever and whenever Thread falls. At the end of a turn you actually have to control a dragon while it fights Thread. This battle may take place on any of three difficulty levels (which you select prior to the start of the game). The results of the Thread fighting will influence the level of respect you enjoy among the Lord Holders in the next turn, and therefore your success in forming new alliances.

Dragonriders of Pern is a game that cleverly mixes elements of Diplomacy—style wargaming, arcade skills, and fantasy roleplaying in a scenario that has already been tested and approved by science fiction and fantasy readers. It will take some time before you learn the mixture of violence, pleading, amiability, and threats it takes to create and hold together a large alliance of individual lords. But it will be worth the trouble to escape to Anne McCaffrey's fantasy world of lords, craftsmen, fighting men, and friendly dragons.—*BM*

CIRCLE 417 ON READER SERVICE CARD

Empire

Empire is a real-time, strategy wargame of global conquest. The design is refreshingly simple, yet the style and scope will test even veteran Caesars.

As emperor of a single city, you send forth legions, ships, and airplanes to conquer the 60-row by 100-column world. In the process of subjugating numerous neutral city-states, you will also run headlong into one or two other power-mad imperialists—played by either the computer or live opponents.

At the start, you see only a three-row by three-column section of the globe. The rest is unknown. As your troops fan out across the countryside and sail over the ocean, the known world expands before your eyes.

Cities can build one of eight types of units—armies, transports, submarines, destroyers, cruisers, battleships, aircraft carriers, and fighter-bombers—with each unit taking a set number of turns to be produced. You give each unit a command, such as move, dig in, or load troops, which it will follow until assigned a new one.

The weakspot of the game is in its complex command structure. Each unit is assigned either a mode or a function. Only certain commands work with certain modes. although you can switch modes or change between modes and functions at any point in the game. Unfortunately, consulting the documentation is like asking Brutus about friendship—it's all in the interpretation.

Nobody said being an emperor was easy, but mastering the commands is a small price to pay for mastering the globe. As cities churn out units, armies conquer territory, and enemy forces emerge from the unknown, you start to suffer from information overload. You tend to neglect rear areas and remote fronts; then suddenly you remember them when you need fresh troops.

Invariably, the computer seems ten turns ahead of you and always seems to find you before you find it. After the initial contact, the war heats up into a battle for initiative. The side that can take the offensive has a better chance to win, but a defensive counterstrike can upset this "sure" victory. Much of the nail-biting excitement of *Empire* grows from this seesaw struggle.

Note that you need an extra serial port and terminal for each additional live player. Also, the more units in play, and the more battles fought, the slower the game runs.

Empire is a wargame, not an arcade game. It challenges the reflexes of the mind, not the wrist. For strategists who delight in organizing and running military campaigns, *Empire* proves the glory that was the mainframe's continues on the microcomputer. —*RSL*

CIRCLE 418 ON READER SERVICE CARD

SOFTWARE PROFILE

Name: Empire
Type: Strategy Wargame
System: 128K IBM PC
Author: Walter Bright
Format: Disk
Language: C
Summary: Simple, yet elegant design offers challenging military campaigns.
Price: $29.95
Manufacturer:
Northwest Software
13928 129th Ave. NE
Kirkland, WA 98033
(206) 823-5388

Starship Challenge

The scenario sounds familiar. Space, the final frontier, is in peril again. With stardates ticking away, you, as Captain Kirk, must pilot the starship Enterprise on a mission to seek out and annihilate invading Klingon and Romulan life forms. In the process, you can beam down to strange new worlds, mine dilithium crystals,

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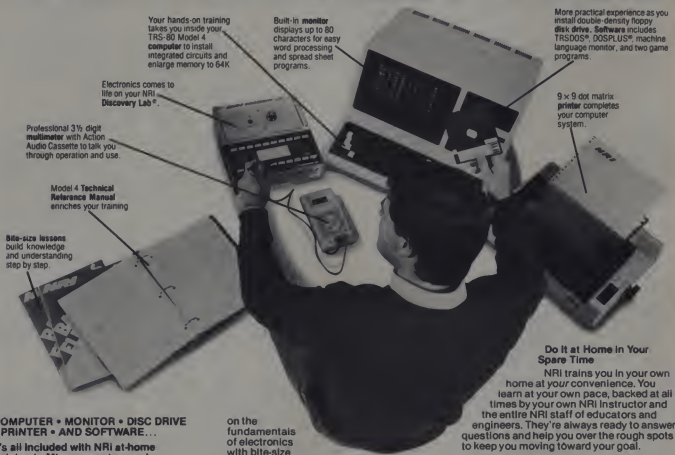
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Starship Valiant

Star Fleet I

and boldly go where no man has gone before.

Starship Challenge has five levels of play—beginner, novice, senior, expert, and emeritus. The higher the level of play, the more Klingons and Romulans you will find in the galaxy and the more often they will use a cloaking device.

The Enterprise is outfitted with the usual shields, phasers, photon torpedoes, and long and short scans. You can warp around the eight-quadrant by eight-quadrant galaxy or use impulse power to move within the ten-sector by ten-sector quadrant. Some quadrants contain a space-time aberration, which can whisk you to another part of the galaxy quickly.

The Klingons divide into two types: regular and command ships. The regular ships generally stay rooted in one spot, firing away until destroyed. Naturally, the command ships are tougher to destroy, and at the higher levels, tend to leave the quadrant to repair damage rather than stay and slug it out.

As you destroy Klingon ships, you disrupt their invasion schedule and gain extra stardates to accomplish your mission. Your score, in part, is determined by a Klingon-to-stardate kill ration.

The adventure part of the game consists of finding a planet and analyzing it for traces of dilithium crystals. Once found, you beam down, mine the crystals, and beam back up. Not very challenging as a whole, but you do need the crystals at the higher levels. They act like a spare battery, replenishing your energy without the need to dock at a starbase.

Win or lose, the game displays your score, including casualties incurred, Klingons killed, and Romulans captured. After you reach a certain score on one level, the program promotes you to the next, more difficult level.

Miklyn Development plans to include planetary mini-adventures, starting with one based on The Squire of Gotham episode, in future versions of *Starship Challenge*. Each mini-adventure contains a clue to defeating the Klingon horde.

Starship Challenge is one of the best Star Trek games available for the IBM PC. With five skill levels, the game remains challenging and exciting long after the first play. If you like the original Star Trek computer game, *Starship Challenge* will make a welcome addition to your gaming library. —*RSL*

CIRCLE 419 ON READER SERVICE CARD

SOFTWARE PROFILE

Name: Starship Challenge
Type: Star Trek game
System: 64K IBM PC
Author: Mike Webb
Format: Disk
Language: Basic
Summary: Excellent adaptation of Star Trek includes some clever touches.
Price: $29.95
Manufacturer:
Miklyn Development Co.
3613 Andover
Bedford, TX 76021
(817) 571-5714

Starship Valiant

Starship Valiant is another Star Trek type game, and like the others, comes with a few twists to keep things interesting.

This time, the Amdrons want to conquer the eight-quadrant by eight-quadrant galaxy. They are just as ruthless as Klingons and Romulans, only a little trickier. They fly three different types of ships—regular battle cruisers, a flagship, and a fuelship—and all of them look the same.

Of course, your mission is to eliminate this Amdron menace using the United Federation Starship Valiant. The Valiant is equipped with torpedoes, lasers, a deflector shield, warp engines, cruise engines, and a big reserve of energy.

During battle, the Amdrons fire lasers and launch torpedoes. The lasers gnaw away at your energy reserves, but the torpedoes are positively lethal. One hit obliterates the Valiant. Fortunately, their torpedoes are slow, so you can dodge them.

This is the best part of the game. In other trek games, you zip into a quadrant and slug it out with the enemy. In *Starship Valiant*, you must constantly maneuver within the quadrant to avoid those Amdron torpedoes, and this gives you a better feel

SOFTWARE PROFILE

Name: Starship Valiant
Type: Star Trek game
System: 128K IBM PC
Author: Randall A. Rice
Format: Disk
Language: Basic
Summary: Solid adaptation of Star Trek.
Price: $39.50
Manufacturer:
Eagle Computer Consulting
3000 North Wales Rd.
Norristown, PA 19403
(215) 277-7638

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of tactical starship combat than other trek games.

A couple twists separate *Starship Valiant* from other trek games. The flagship directs the entire invasion and orders the battle cruisers to attack one of your starbases. If you destroy the flagship, the invasion falls apart, and all battle cruisers scatter to the edge of the galaxy trying to escape your wrath.

Finally, the Amdrons possess a nasty tractor beam, which can pluck you from a safe quadrant and transport you to one with wall-to-wall enemy ships.

The game contains three levels of play: First Officer, Captain, and Admiral. The first level provides enough challenge to keep the average player from getting bored, but not so much that it overwhelms a novice. The Captain level presses your command skills, and the Admiral level is downright tough.

Starship Valiant is interesting, challenging, and fun. Its fast-action maneuvering brings an exciting new dimension to the classic game of Star Trek. —*RSL*

CIRCLE 420 ON READER SERVICE CARD

Star Fleet I

Star Fleet I continues the evolution of the classic Star Trek computer game by adding extensive color and sound, and including a few embellishments of its own.

The enemy is invading the eight-quadrant by eight-quadrant galaxy again, and your mission is to seek out and destroy them. However, the Federation has been replaced by the United Galactic Alliance, and instead of Klingons and Romulans, you face a miltitude of Krellans and a few powerful Zaldrons.

Each cruiser shoots phasers and torpedos and relies on shields for protection. However, the program contains a few extra embellishments. The ship can lay mines, and the shield is divided into four parts, each of which is assigned a strength independently of the others.

Each ship also carries a complement of 70 space marines. Once you inflict enough damage on an enemy ship, you can teleport the marines onto the ship to capture it.

If you take damage, some of the 13 internal ship systems, such as phasers, engines, shield control, and life support, become inoperative, requiring either energy, time, or a starbase to repair. In addition, enemy agents sometimes slip aboard and sabotage these systems, only you never know they are there until they destroy a system. The ship carries a security force to ferret out these agents.

SOFTWARE PROFILE

Name: Star Fleet I
Type: Star Trek Game
System: 96K IBM PC
Format: Disk
Language: Basic
Summary: Excellent trek game with extensive color and sound.
Manufacturer:
Cygnus
P.O. Box 57825
Webster, TX 77598

Star Fleet I has 10 levels of difficulty. You must complete the levels in order, starting as a Cadet, which is level 1, and progressing through Admiral Emeritus, which is level 10. It also gives you a choice of a short, medium, or long game.

Star Fleet I comes with an extensive 98-page "Officer's Manual" detailing the 25 commands you need to run the cruiser. The entire manual should be adopted as an industry standard for clear, concise, well-organized documentation.

The program engulfs you in sound and color. The opening sequence treats you to the beginning strains of "Also Sprach Zarathustra" and then fuses into "Flight of the Valkyrie." Throughout the game, various beeps and tones signal phasers, torpedoes, damage, and red alert. If you defeat the invading fleet, you hear the victory march from "Star Wars." If you win a promotion, you are treated to "Pomp and Circumstance."

Meanwhile, color bursts across the screen. Red alerts are really red, the tactical display is light blue, and various messages are highlighted with shades of green, yellow, and blue.

Star Trek fans rejoice. *Star Fleet I* is a truly captivating game, providing fast-paced action and blossoming with extraordinary color and sound effects. —*RSL*

CIRCLE 421 ON READER SERVICE CARD

Triple BrainTrust

Triple BrainTrust is a combination tic-tac-toe and trivia game, much like the old TV game show "Hollywood Squares." Players alternate answering questions on a variety of topics. Correct answers place an X or O in a square, and three in a row wins the round.

Triple BrainTrust contains 12 trivia topics—movie, famous places, football, baseball, general sports, geography, vocabulary, famous people, science, children's stories, math, and early learning. Each topic is geared for a certain age group.

As with most trivia games, you either know the answers or you don't. Sample questions include: How many miles are run in a marathon? Which continent contains the Alps? What color is a banana?

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212A Modem Comparison Chart *

STANDARD FEATURES	PRO	HAYES STACK	NOVATION SMARTCAT+	ANCHOR 1200	US ROBOTICS PASSWORD
300/1200 Baud (212A)	✓	✓	✓	✓	✓
Intelligent Microprocessor	✓	✓	✓	✓	✓
Tone and Pulse Dialing	✓	✓	✓	✓	✓
Hayes Command Compatible (Works with Smartcom™)	✓	✓	✓	✓	✓
Additional telephone jack with exclusion switching	✓		✓	✓	
Analog loop back self test	✓		✓		
Self Test at Powar Up	✓		✓		
Call Progress Detection (Busy, Dial Tonas, Trunk Busy, etc.)	✓		✓		
Speaker and External Volume Control	✓	✓	✓	✓	
Full Complament of Status Lights	✓	✓	✓		
8 Switch Selectable power-up defaults	✓	✓	✓		
Adaptive Dialing	✓		✓		
Auto Redial on Busy	✓	✓	✓		
Ergonomically designed easy to read front display panel	✓				
Internal Stand-Alone Power Supply	✓				
Built in Real Time Clock/Calendar	✓				
Help Command	✓				
300 baud connect while maintaining 1200 baud RS-232 link	✓				
EXPANDABLE OPTIONS					
Automatic Receiver Buffer	✓				
Automatic Transmit Buffer	✓				
On-board Personal/Business Directory	✓				
Buffer, Expandable to 64K	✓				
Auto Logon Macros	✓				
Auto message transmission to groups of numbers	✓				
Records call duration	✓				
12-character Alphanumeric Display	✓				

Some parameters made by Prometheus are the basis of the best information available to manufacturers at time of printing.

CIRCLE 172 ON READER SERVICE CARD

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MINER 2049
micro fun
Caribbean
micro fun
micro fun
SHORT CIRCUIT
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micro fun
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CIRCLE 159 ON READER SERVICE CARD

Digger

Run for the Money

the disk exactly, or the program declares it wrong.

Like tic-tac-toe, *Triple BrainTrust* allows only two contestants to play at once. If a person is unavailable, you may play the computer, but be warned, the computer knows all the answers and never misses a question.

Since text requires little color, *Triple BrainTrust* uses mostly black and white graphics. In some of the children's questions, it adds blue and purple coloring, but even the X and O are white on black. Likewise, some of the children's questions play music, but the program generally remains silent.

When you tire of the questions on the original disk, you can create your own topics and questions quickly and easily. Roughly 900 questions, divided into 15 topics, can be saved per disk.

Triple BrainTrust is a flexible trivia game. Although its graphics could be more colorful, regular black and white text suffices for most uses. Its open-ended format allows for an unlimited number of questions, so long as someone is willing to think them up and type them in. —*RSL*

CIRCLE 422 ON READER SERVICE CARD

SOFTWARE PROFILE

Name: Triple BrainTrust
Type: Trivia game
System: 64K IBM PC
Author: Paul and Alice Shapin
Format: Disk
Language: Basic
Summary: A flexible Hollywood Squares.
Manufacturer:
Reston Publishing
11480 Sunset Hills Rd.
Reston, VA 22090
(800) 336-0338

PresidentialFever

What better time to bring out a game based on the election process than in an election year. *PresidentialFever* is a trivia game that tests your knowledge of little known facts about the United States.

PresidentialFever is divided into three games, Electoral college, Republican nomination, and Democratic nomination. You score points based on the actual electoral or delegate vote for each state. Each game asks you a question about a particular state. If you answer the question correctly, you win the votes from that state.

Like a real election, you need a minimum number of votes to win. For the Republican and Democratic nomination, this equals 1118 and 1967 respectively. For the Electoral College, it is 270.

PresidentialFever contains thousands of questions on all sorts of subjects, including geography, history, population statistics, economics, Republican and Democratic delegate votes per state, political figures, state capitals and cities, and state birds and flowers.

PresidentialFever has five skill levels to challenge young and old alike. Level 1 requires you to choose the state with the most votes. Level 2 includes questions on state capitals and cities, while Level 3 adds economic and geographical questions. Level 4 adds difficult political, economic, historical, and current events questions. Level 5 allows you to pick the question format and vary the level of difficulty.

You can play against the computer or against another person. The computer is absolutely ruthless. It never misses a question and always gets the most votes.

Trivia fans will find *PresidentialFever* appealing and challenging. The game is really more about the United States than politics, although everyone, especially young children, can learn the facts and figures surrounding the election process. —*RSL*

SOFTWARE PROFILE

Name: PresidentialFever
Type: Trivia Game
System: 128K IBM PC, DOS 2.0
Author: Mike Skramstad
Format: Disk
Summary: Interesting brain teaser about United States trivia.
Price: $39.95
Manufacturer:
Data-Win
P.O. Box 60995
Terminal Annex
Los Angeles, CA 90060
(213) 250-3916

CIRCLE 423 ON READER SERVICE CARD

Digger

There's a veritable mountain of computer games on the market. Some possess the quality of a mountain. Others promise a mountain, but end up as molehills. Some are just the pits. After playing *Digger*, you'll be screaming Eureka! and staking out a claim to a goldmine of fun.

Digger, an addictive arcade game, combines the best aspects of Pac-Man and Dig-Dug to create a free-wheeling, free-form maze game. Better yet, it adds

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CIRCLE 190 ON READER SERVICE CARD

The Coveted Mirror

Junior's Revenge

enough spectacular sound effects and imaginative graphics to start a gold rush.

As Digger, a super tunneling machine with a red body, greedy green jaws, and yellow tires, you carve out new shafts in an abandoned mine to collect green emeralds and gold nuggets. Like Pac-Man's dots, the emeralds are gulped as you pass over them.

A catchy, driving beat plays in the background as you gnaw through yellow-red earth. Each gulped emerald sounds a resonant note, each higher than the last. If you can gulp an octave of emeralds, you earn bonus points. When you clear a screen, the program sings a happy tune that sounds like a wild, Mexican fiesta.

Of course, the denizens of the mine, the Nobbins, resent your intrusion, not to mention the piracy of their buried treasure. These triangular green marauders with beady yellow eyes and stomping red feet tax your reflexes as they chase after you faster than the IRS.

The Nobbins follow the shafts that you have tunneled out. If they cannot catch you after a certain amount of time, some become so enraged, they are transformed into deadlier Hobbins. These nasties look like green turkey heads, complete with red wattles. They also burrow through the rock and try to cut you off at the subterranean pass. If a Nobbin or a Hobbin touches you, Digger goes to the great junkyard in the sky, a tombstone rises on the spot, and the funeral dirge plays in the background.

Digger is not defenseless, however, and there is more than one way to stop a Nobbin or a Hobbin. Three, in fact. As in Dig-Dug, you can entice them into a shaft, undermine a bag of gold, and watch it fall and squash the offending creature. If the beasties advance from above, you can fry them with a roof-mounted fireball. Finally, if you evade them long enough, you can gulp a cherry, which works just like a power pill in Pac-man. As you hunt down the Nobbins and Hobbins, the "William Tell Overture," plays in the background.

Excellent sound effects, graphics, and action make *Digger* a real gem. It never loses its luster even after hours of play. *Digger* strikes a rich vein in a mountain of games. —*RSL*

CIRCLE 424 ON READER SERVICE CARD

SOFTWARE PROFILE

Name: Digger
Type: Maze game
System: 64K IBM PC, Color Graphics Adapter
Format: Disk
Language: Machine language
Summary: A goldmine of fun.
Price: $39.95
Manufacturer:
Windmill Software
2209 Leominster Dr.
Burlington, Ontario
Canada L7P3W8
(416) 336-3353

Run for the Money

Many educational arcade games are heavy on the game and woefully light on the education. Often, they rely on repetitious drills instead of teaching new skills. *Run for the Money* breaks from this pattern and offers practical, working knowledge of fundamental economic principles.

Run for the Money is a two-player game. You and an opponent become Bizlings, "creatures searching the universe for good business opportunities." The story is that your spaceship flew through a zinger storm, which knocked out the protective paint shield, forcing you to land on the planet Simian.

The Simians, who spend all of their time swinging from trees, want to buy synannas, synthetic bananas made from rufs. Rufs are mined and sold by six different Ruffians. Rufs come in three different qualities, and your spaceship just happens to be able to convert rufs into synannas.

The whole idea is to buy rufs, sell synannas, make a profit, buy paint to replace the shield, and then be the first to lift off planet Simian.

The Simians remember everything. If you sell them high-quality synannas at

SOFTWARE PROFILE

Name: Run for the Money
Type: Educational arcade game
System: 128K IBM PC, Color Graphics Adapter
Author: Tom Snyder
Format: Disk
Language: Compiled Basic
Summary: Interesting two-player game teaches basic principles of economics.
Price: $49.95
Manufacturer:
Scarborough Systems Inc.
25 North Broadway
Tarrytown, NY 10591
(914) 332-4545

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CIRCLE 120 ON READER SERVICE CARD

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one price, then switch to medium-quality at the same price, they continue to buy for a while, but become disenchanted with the lower quality of your product and stop purchasing your synannas.

Furthermore, although you negotiate with an individual Ruffian to lower its price, sometimes it gets impatient and refuses to sell you rufs.

As added incentive, at the beginning of each trading week you use a simple spreadsheet program to plan your profits. The spreadsheet allows you to explore various pricing and production strategies. If your profit comes close to your prediction, you earn a bonus.

The 32-page manual provides a good overview on running the game. Perhaps the best part is a section describing 12 different strategies used on Earth—including ad campaigns, underpricing, copycat, and bait and switch—and how they apply to Simian.

Run for the Money teaches many sophisticated economic concepts, including the laws of supply and demand, bidding practices, production processes, marketing decisions, as well as good old fashioned business sense and customer service. You get a theoretical feel for running a business and have fun at the same time. —*RSL*

CIRCLE 425 ON READER SERVICE CARD

The Coveted Mirror

Life was once peaceful in the make-believe land of Starbury, but not long ago an evil rogue named Voar brought that tranquility abruptly to an end. He broke the Coveted Mirror, the magical defense of Starbury's people. Managing to steal four of the five precious shards, Voar attained enough power to enslave the entire population.

SOFTWARE PROFILE

Name: The Coveted Mirror

Type: Graphic adventure

Authors: Eagle Berns and Holly Thomason

System: 48K Apple

Format: Disk

Summary: Stimulating and refreshing adventure

Price: $34.95

Manufacturer:
Penguin Software
P.O. Box 311
Geneva, IL 60134
(312) 232-1984

Step into the medieval times of swords and sorcery. In *The Coveted Mirror*, a hires graphic adventure from Penguin Software, you have been asked to retrieve the stolen shards and free the Starburian people!

As the game begins, you find yourself in a prison cell of Voar's monstrous stronghold, where you must outsmart Boris, a large, pot bellied nit wit assigned to check on you regularly.

After you establish a friendly relationship with Boris, he will mark on your hourglass the time at which he will return to check on you. This provides you with enough time to travel to the village (after you discover how to escape from your cell), where you must negotiate with shop keepers for necessary equipment. In addition, you must scour the countryside for other items to aid you in your quest.

During the quest, you must periodically return to the castle to be present when Boris makes his rounds, but afterward you can resume your mission.

The graphics scenes in *The Coveted Mirror* are very well done. More than 100 colorful, detailed frames grace the entertaining story.

Furthermore, the game offers a refreshing break from "adventure monotony," the sometimes disconcerting boredom that afflicts worn out adventurers. At certain points during the adventure, *The Coveted Mirror* switches to mini-arcade or skill games. For instance, you may find a jousting arena in your travels, and if you enter, you will confront a computer controlled horseman in a quasi-arcade game.

The Coveted Mirror is a top quality graphics adventure featuring outstanding realism and refreshing innovations in computer adventure. In short, it is one of the best graphics adventures available for the Apple II. —*SW*

CIRCLE 426 ON READER SERVICE CARD

Junior's Revenge

Junior's Revenge is a Color Computer version of Donkey Kong Jr., the popular coin-operated game that begins where the original Donkey Kong left arcaders hanging by a vine. As a loyal gorilla son, Junior must rescue his father from the clutches of an unforgiving man named Luigi, who, like Mario in the arcade version, captured the huge ape and placed him behind bars.

The mission requires all of the speed, timing, and courage that Junior can muster. Four different screens present vines and chains to climb, plunging gorges to span, moving platforms to leap upon, giant "zuzu birds" to avoid, and deadly "vine-gators" to outwit. For example, the first screen has 11 vines joined by several scattered sections of floor, demanding shrewd leaping and climbing over chasms, from floor to vine and from vine to floor. Junior's objective in this scene, which is further complicated by the roaming vine-gators,

SOFTWARE PROFILE

Name: Junior's Revenge

Type: Action

System: 32K TRS-80 Color Computer

Format: Cassette or disk

Summary: Become a loyal gorilla's son and rescue dad.

Price: $27.95 cassette; $30.95 disk

Manufacturer:
Computerware
Box 668
Encinitas, CA 92024
(619) 436-3512

is to ascend to the top and grab a key from Luigi.

The second scenario consists of eight hanging chains, six of which dangle keys that Junior must push upward into place as he climbs. The third screen introduces a trampoline, moving platforms, and elusive chains hanging from a shifting, gear driven mechanism. In the fourth screen at Luigi's hideout, Junior must conquer an inferno of conveyor belts and vines.

Cherries hang from vines and chains in each screen and may be picked for points. Picked fruit plummets to the bottom of the screen and may crush opposing creatures in its path, in which case extra points are awarded.

This game creatively and resourcefully employs the fine graphics capabilities of the Color Computer.

With four different scenes, the game maintains all the challenge of the coin-operated version. *Junior's Revenge* demands quick reactions and patience that will thwart even experienced arcaders.

Junior's Revenge is a fine program in most respects, including graphics use and challenge. Color Computer owners who enjoyed Donkey Kong Jr. will regard *Junior's Revenge* as one of their favorites. —*SW*

CIRCLE 427 ON READER SERVICE CARD

Threshold

Intelligence has reported that more than 20 waves of alien craft are currently in the star system, harassing the people and disrupting trade. Given command of the Earth Federation Ship Threshold, you face the perilous mission of freeing the empire from the sinister grip of these invaders.

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Threshold

Skramble!

Threshold, the game, is a shoot-em-'up much like Galaxian for one or two players. The player's ship, located at the bottom of the star-lit screen, faces waves of aliens at the top.

Each of the 24 waves of aliens has a unique appearance and style of movement. For example, the first phase pits the player against bird-like ships with beating wings, while the second is against skull types with crushing teeth. All are displayed in colorful, detailed graphics. The game becomes more difficult with every passing wave and therefore maintains its challenge even during long play.

The player's ship is armed with Delta Class Lasers which can overheat if used indiscriminately. A gauge resembling a thermometer indicates the heat level of the lasers and is displayed on the right side of the screen. If the level rises too high, the player must wait a few seconds for the lasers to cool before he can resume shooting.

SOFTWARE PROFILE

Name: Threshold
Type: Action
System: Apple II, Atari, C-64, ColecoVision
Format: ROM cartridge, disk
Summary: Fine Galaxian derivative
Price: $34.95
Manufacturer:
Sierra On-Line, Inc.
Sierra On-Line Bldg.
Coarsegold, CA 93614
(209) 683-6858

The most closely-guarded secret of the ship is its ability to implement Hyper Warp Drive. Useable once for each of the five available ships, it boosts the speed of the Threshold for a few seconds and in effect slows the invaders so that the player can avoid a hazardous situation or fight them more effectively.

Threshold is a fine action game with a few interesting twists. Sporting a wide variety of invaders and innovative new features, it is certainly one of the best Galaxian derivatives available for the Vic.—*SW*

CIRCLE 428 ON READER SERVICE CARD

Skramble!

Skramble! is Microdigital's version of the similarly named coin-operated favorite in which you become the pilot of a space-craft and must blast through the defenses of a hostile enemy planet.

The landscape scrolls from right to left as your ship warps through the defenses. The first of the eight phases leads you over a landscape littered with oil tanks, helicopters, and stationary rockets. This incredibly simple section, which could be called an exercise in fire button pressing, is followed by a similar scene in which the rockets launch into the path of the ship. Next is a phase known as Wiggy Tunnel, in which you face the usual ground installations along with roaming spider shaped guards. In scene four, you must maneuver through a narrow, twisty cavern. As in the beginning phases, the remaining four, called Meteor Trail, Rocket City, City Maze, and Homing Slot, have specific objectives uniquely their own.

The limited fuel supply that you receive at the beginning of the game must be maintained to complete the mission. Destroying enemy oil tanks along the way will replenish a lagging supply.

SOFTWARE PROFILE

Name: Skramble!
Type: Action
System: Vic 20, C-64
Format: Cassette, disk
Summary: Multi-phase maze shoot-'em-up
Price: $14.95, $24.95
Manufacturer:
Microdigital
P.O. Box 1110
Webster, NY 14580
(716) 872-0518

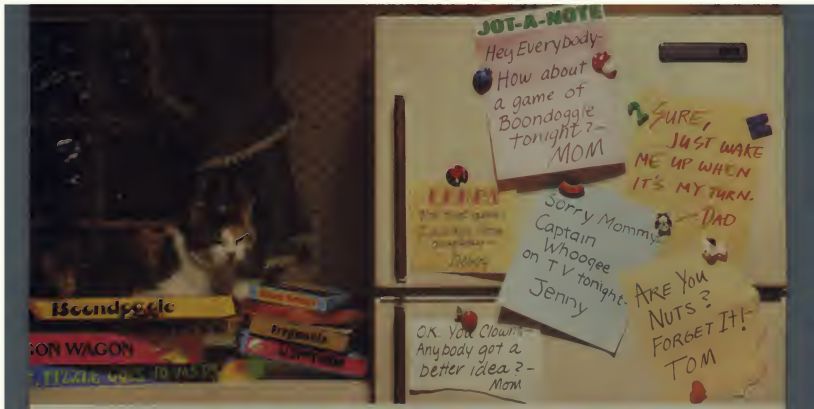
The game ends if you crash or run out of fuel. Unlike other games in which additional ships are available after a player meets his demise, *Skramble!* supplies its pilot with only one.

Sporting eight different full-length phases, *Skramble!* is quite involved for an arcade-style game. The change of scenery adds variety to play and defeats the repetitous boredom that plagues other games. In addition, I sensed a hint of that addictive quality that results from striving to reach a new phase.

The graphics in *Skramble!* leave much to be desired, however. Furthermore, I feel that the good color capabilities of the Vic could have been utilized more effectively, especially in place of the dismal black used in the cavern scenes.

All in all, *Skramble!* is an extensive game with a few disappointing weaknesses. It may appeal to serious arcaders who can appreciate good action with no frills. —*SW*

CIRCLE 429 ON READER SERVICE CARD


JOT-A-NOTE
Hey Everybody- How about a game of Boondoggle tonight?- MOM
SURE, JUST WAKE ME UP WHEN IT'S MY TURN. -DAD
Sorry Mommy Captain Whoogee on TV tonight- Jenny
ARE YOU NUTS? FORGET IT! TOM
O.K. You Clowns- Anybody got a better idea?- Mom
Boondoggle

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Announcing a small imp

It's 12″ x 11¼″ x 2¼″
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Yet with 128K, the new Apple® IIc Personal Computer is a lot bigger than it looks.

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The versatility to run over 10,000 different software programs.
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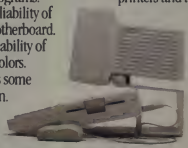
And the artistic ability of 16 high-resolution colors.
The IIc also has some talents of its very own.
For instance, a switchable 80/40-character display.
Switchable QWERTY/Dvorak keyboard.



Thin, isn't it? Even with its built-in disk drive.

A built-in half-high 143K single-sided disk drive.
Built-in serial ports for modems, printers and an extra half-high drive.
Even built-in mousetronics so it's ready to use a mouse and all the new Apple II mouseware.
And our newest brainchild is certainly not an orphan.
You can grow it with a whole family of Apple II accessories and peripherals.

rovement on the Apple IIe.

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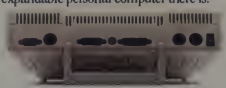
The IIe can now use our ProFile™ hard disk—so it can store about 2400 pages of anything you'd like to remember.

And the Apple IIe is still the most expandable personal computer there is.



Built-in ports for making all the right connections.

You can increase its RAM to an elephantine 512K. Add a Z-80 card to run CP/M.™

In fact, you can grow it with enough cards and peripherals to run just about any family business. Like Saudi Arabia.

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** Don't asterisks make you suspicious as all get out? Well, all this one means is that the IIc CPU alone weighs 7.5 pounds. The power pack, monitor, an extra disk drive, a printer and several bricks will make the IIc weigh more. Our lawyers were concerned that you might not be able to figure this one out for yourself. ** The FTC is concerned about price fixing. So this is only a Suggested Retail Price. You can pay more if you really want to. Or less.* *© 1984 Apple Computer Inc. Apple, the Apple logo and ProFile are trademarks of Apple Computer Inc. CP/M is a trademark of Digital Research Inc.*

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CIRCLE 134 ON READER SERVICE CARD

Upgrading Your IBM PC

One or more of these add-ons can make your PC more versatile and easier to use.

Russ Lockwood

Some time ago, you took the financial plunge and bought an IBM PC. You lavished appropriate reverence on it, learned how to use it, and eventually became comfortable running various programs. Now you find that you have outgrown the original equipment. You need more memory to run sophisticated software like databases and spreadsheets; you want to store more information on a floppy disk; or you want to add business graphics to reports. Whatever the reason, you want to upgrade your PC, and that usually means adding up to six major components: memory board, floppy disk drive, hard disk drive, graphics board, color monitor, and keyboard.

Memory Boards

Early models of the IBM PC had only 64K of memory on the motherboard. However, most current business software and many games require more than 64K. Assuming that the motherboard of your machine holds only 64K, you can install a plug-in memory board with an additional 576K, for a total of 640K of memory—if you need that much.

The IBM PC actually addresses up to 1Mb of memory; however, the computer reserves 360K for the graphics card, monochrome card, and ROM. If you own a later model with a 256K limit on the motherboard, you can install a memory board with an additional 384K, which again totals 640K of memory. Note that most plug-in memory boards require that you fill the motherboard completely before you can use the additional memory.

As a whole, add-on boards for the IBM PC from most manufacturers tend to be well-made and reliable; hence your main consideration are features and price. Most boards hold a maximum of either 256K or 384K of memory, although a few go up to 576K. Some manufacturers "piggyback" a second memory board onto the original to increase memory while using only one expansion slot.

The chart on page 126 compares features of plug-in memory boards.

Many memory expansion boards offer a wide array of additional functions and features such a clock/calandar, parallel port, serial port, and game port. You can think of them as multi-function boards with memory or memory boards with multiple functions.

A clock/calendar is exactly what it sounds like. The board contains a battery and automatically keeps track of the time and date whether the PC is on or off.

The parallel port connects to a printer, while the serial port, sometimes referred to as an asynchronous communications port, can connect to a modem, plotter, or other serial device. You can also use a serial port to connect the IBM PC directly to another computer with a cable. The game port connects to a joystick, paddle, graphics tablet, or other input device.

Most boards also come with software that allows you to set up a RAM disk and print spooler. A RAM disk sets aside memory to simulate a floppy disk drive, which speeds up program operations and decreases wear and tear on the drives. A print spooler sets aside memory as a buffer, which allows you to print out a file while using the computer for other operations.

Floppy Disk Drives

Two disk drives are almost a necessity, especially if you plan to use sophisticated business software. In addition, much of today's software requires double sided drives rather than single sided drives that came with the original PC. Furthermore, double sided drives let you store twice as much data per disk as single sided drives.

The most common floppy disk drives use industry standard 5¼" floppy disks and come in full height and half height sizes. The two sizes offer identical performance; the only difference is that you can fit either one full height drive or two half height drives in one disk drive slot. The full height drives are generally easier to install than the half height drives.

A comparison of replacement floppy disk drives appears on page 128.

Again, the reliability of disk drives is quite good. They will eventually wear out as the heads deteriorate, but not before they have logged thousands of hours of access time, which translates into years of operation. Using additional memory and a RAM disk extends the

life of the drives even further.

The main operational difference between types of disk drives is the amount of data they place on a floppy disk. The more data stored per disk, the fewer disks you need to hold the same amount of information. The disk drives listed in the chart use 48 tracks per inch (tpi) and work with standard PC-DOS. Other drives use 96 tpi and store roughly twice as much data per disk as the 48 tpi drives, but they require special software to do so.

One other feature to look for is the method of locking the disk into place. You have a choice of two types: flip-up doors and rotating knobs. We find that rotating knobs have less chance of mangling the disk and the locking mechanism tends to last longer than the flip-up doors.

Hard Disk Drives

Just as floppy disk drives use floppy disks to store information, hard disk drives use hard disks. A hard disk drive offers three significant advantages over a floppy disk drive: convenience, speed, and storage space.

Hard disk drives are generally self-contained units although a few newer ones have removable disk cartridges. Thus, you rarely insert and take out hard disks the way you do floppy disks. Hence, you do not have to worry about losing, bending, or destroying your storage medium. In terms of speed, accessing a hard disk is faster than accessing a floppy disk, which can save you time if your software constantly accesses the disk.

Two disk drives are almost a necessity, especially if you plan to use sophisticated business software.

Finally, hard disks store much more information than floppy disks. While a standard 5¼" double sided, double density floppy disk stores 360K, a hard disk stores at least 5Mb, and one manufacturer makes a 140Mb model.

Hard disk drives mount either internally, taking the place of a floppy disk drive within the system unit, or externally, sitting on the desk outside the system unit. Internal hard disk drives usually have a storage capacity of 5, 10, or 20Mb. External disk drives can hold more. The 140Mb model mentioned above is an external hard disk drive.

Plug-In Memory Boards for the IBM PC

Manufacturer	Board Name	Max RAM	Piggyback	Clock Calendar
ABM Computer Systems 3 Whitney Irvine, CA 92714 (714) 859-6531	MEM 512 Omniboard Superboard	512K 0K 384K	No No No	No Yes Yes
AST Research 2121 Alton Irvine, CA 92714 (714) 863-1333	ComboPlus MegaPlus II MegaPak Six Pack Plus MP Expansion	256K 256K 256K 384K 256K	No No Yes No No	Yes Yes No Yes No
Apparat Inc. 4401 S. Tamarac Pkwy. Denver, CO 80237 (303) 741-1778	Combo II 512K RAM Crambo	0K 512K 512K	No No Yes	Yes No Yes
Dilog PC Products 12800 Garden Grove Blvd. Garden Grove, CA 92643 (714) 534-8950	Electronic Disk	368K	No	No
Everex Systems Inc. 891 Maude Ave. Mountain View, CA 94043 (415) 967-1495	Magic Card	384K	No	Yes
Maynard Electronics 400 E. Semoran Blvd. Casselberry, FL 32707 (305) 331-6402	Sandstar Multifunction Sandstar Memory	256K 320K	No Yes	Opt. No
Microlog Inc. 222 Route 59 Suffern NY 10901 (914) 368-0353	Baby Blue II Little Red RAM Card	256K 256K	No No	Yes No
Microsoft 10700 Northup Way Bellevue, WA 98004 (206) 828-8088	System Card	256K	No	Yes
Persyst Products 15801 Rockfield Blvd. Irvine, CA 92714 (714) 660-1010	Time Spectrum STC 256 Time Spectrum SB 384 Versapak	256K 384K 256K	No No Yes	Yes Yes No
Quadram Corp. 4355 Industrial Blvd. Norcross, GA 30093 (404) 923-6666	Quadboard I Quadboard II Quadboard 384 Quadboard 512+	256K 256K 384K 512K	No No No No	Yes Yes Yes No
Seattle Computer 1114 Industry Dr. Seattle, WA 98188 (206) 575-1830	RAM + 3	256K	No	Yes
STB Systems Inc. 601 N. Glenview Richardson, TX 75081 (214) 234-8750	RioPlus SuperRio STB Piggyback	384K 256K 512K	No No Yes	Yes Yes No
Tecmar 6225 Cochran Rd. Cleveland, OH 44139 (216) 349-0600	Captain Wave Bosun	384K 256K 0K	No No No	Yes No Yes
Titan Technologies P.O. Box 8050 Ann Arbor, MI 48107 (313) 662-8542	Titan Cygnus P-1 Cygnus S-1	576K 0K 0K	No No No	Yes Yes Yes
Vista Computer Co. Inc. 1317 E. Edinger Santa Ana, CA 92705 (714) 953-0523	PC Clock/IO Maxicard Multicard Plus PC Master	0K 576K 384K 0K	No No No No	Yes No Yes Yes

Parallel Port	Serial Port	Second Serial Port	Game Port	RAM Disk	Print Spooler	Suggested Retail Price	Comments
No	No	No	No	Yes	Yes	(64K) $295	
Yes	Yes	Opt.	Opt.	No	No	$215	Optional ports $50 ea
Yes	Yes	No	Opt.	Yes	Yes	(0K) $295	
Yes	Yes	No	No	Yes	Yes	(64K) $395	
Opt.	Yes	Opt.	Opt.	Yes	Yes	(64K) $395	Optional ports $50 each
No	No	No	No	No	No	(64K) $475	Piggybacks onto MegaPlus II
Yes	Yes	No	Opt.	Yes	Yes	(64K) $395	Optional port $50
No	No	No	No	Yes	Yes	(64K) $295	
Yes	Yes	No	Yes	No	No	$189	
No	No	No	No	Yes	No	(64K) $189	
Yes	Yes	No	Yes	Yes	No	(64K) $359	
No	Yes	No	No	N/A	N/A	(368K)$1295	Emulates a disk drive without additional software and maintains memory for up to three hours
Yes	Yes	Opt.	Yes	Yes	Yes	(0K) $275	Includes word processing and database software; optional port $25
Opt.	Opt.	No	Opt.	Yes	No	(64K) $219	Optional ports
No	No	No	No	Yes	No	(0K) $ 98	$39-$76 each
Yes	Yes	Yes	No	Yes	Yes	(64K) $695	Includes additional
No	No	No	No	Yes	No	(64K) $349	software
Yes	Yes	No	No	Yes	Yes	(64K) $395	
Opt.	Yes	Opt.	No	Yes	Yes	(64K) $395	Optional Ports
Yes	Yes	No	Opt.	Yes	Yes	(64K) $395	$30-$50 each
No	No	No	No	No	No	(64K) $225	Piggybacks onto STC 256
Yes	Yes	No	No	Yes	Yes	(64K) $395	
No	Yes	Yes	No	Yes	Yes	(64K) $395	
Yes	Yes	No	Yes	Yes	Yes	(64K) $395	
No	Yes	No	No	Yes	Yes	(64K) $325	
Yes	Yes	No	No	Yes	Yes	(0K) $210	
Yes	Yes	No	Yes	Yes	Yes	(64K) $395	
Yes	Yes	Yes	Yes	Yes	Yes	(64K) $419	
No	No	No	No	No	No	(256K) $519	
Yes	Yes	No	No	Yes	Yes	(0K) $349	
No	No	No	No	Yes	Yes	(64K) $299	
Yes	Yes	No	No	Yes	Yes	$195	
Yes	Yes	Yes	No	Yes	Yes	(64K) $556	
Yes	No	No	Yes	No	No	$199	
No	Yes	No	Yes	No	No	$229	
Yes	Yes	No	No	Opt.	Opt.	$199	Optional Software $30
No	No	No	No	Opt.	Opt.	(64K) $274	
Yes	Yes	No	Yes	Opt	Opt.	(64K) $395	
Yes	Yes	Yes	Yes	No	No	$359	Includes speech synthesizer

Replacement Floppy Disk Drives

Manufacturer	Drive Name	Formatted Recording Capacity	Full Height	Half Height	Double Sided
Control Data 2200 Berkshire Lane North Plymouth, MN 55441 (612) 921-4400	409	360K	Yes	No	Yes
Qume 2350 Qume Dr. San Jose, CA 95131 (408) 942-4000	Qume Trak 142	327K	No	Yes	Yes
Shugart Corp. 475 Oakmead Pkwy. Sunnyvale CA 94086 (408)737-4355	SA 475	360K	No	Yes	Yes
Tandon Corp. 20320 Prairie St. Chatsworth, CA 91301 (213) 993-6644	TM100-1 TM100-2 TM50-1 TM50-2 TM55-2	160K 360K 160K 360K 360K	Yes Yes No No No	No No Yes Yes Yes	No Yes No Yes Yes
Teac Corp. 7733 Telegraph Rd. Montebello, CA 90640 (213) 726-0303	FD-55A FD55-B	160K 360K	No No	Yes Yes	No Yes
Toshiba 2441 Michelle Dr. Tustin, CA 92680 (714) 730-5000	ND-02D ND-02D	160K 360K	No No	Yes Yes	No Yes

Just as floppy disk drive need a disk controller, so do hard disk drives. The hard disk controller takes up an expansion slot. A cable attaches between the controller and drive. Internal hard disk usually run off the power supply in the PC. External drives usually have their own power supplies.

Along with all these features, hard disk drives carry a stiff price. While you can buy a floppy disk drive for around $250, hard disk drives run into the thousands of dollars. The greater the storage capacity, the higher the cost. And do not forget to include the price of the disk controller. Another fact you should know is that backing up a hard disk is not as easy as backing up a floppy. Since a hard disk holds so much information, you need many floppies to make a second copy of your data, not to mention the time it takes the disk drives to exchange information.

An alternative to floppy disks for backing up a hard disk is a tape drive. A tape drive is exactly what it sounds like. Your data are stored on magnetic tape. The better drives have cartridges that you can take out, so you can make more than one copy of your data. If you should suffer a catastrophic hard disk drive failure and your data disappear, the tape drive can read the data into the new or repaired hard disk drive.

Color Graphics Boards

If you use the IBM PC strictly for word processing and spreadsheet work, you do not need a graphics board. However, if you want to turn numbers into graphs and pie charts, see color on your monitor, or play the arcade favorites, you need a color graphics board.

The IBM graphics board supports only a color monitor, which is fine until you want to use a monochrome monitor. For extensive word processing, a monochrome green or amber screen monitor is easier on the eyes and displays better defined characters than a color monitor. In answer to this need, many manufacturers now offer graphics boards that support both color and monochrome monitors.

Graphics boards offer different pixel resolution depending on the number of colors appearing on the screen at once. The fewer the colors, the higher the resolution, and the higher the resolution, the better defined the shapes on the screen. See the chart of plug-in graphics boards on page 130.

Some graphics boards offer a resolution far better than that of the IBM color graphics board. While this is desirable, a word of caution is necessary. Many programs do not recognize this superior resolution. Unless the software addresses the extra pixels, you see standard IBM resolution.

Two other features to look for are a parallel port and a light pen interface. The parallel port lets you send images to a printer, and a light pen allows you to "draw" images on the screen. In addition, some manufacturers include graphics utilities with their boards.

Color Monitors

If you have the IBM Color Display connected to your PC, you already own one of the finest color monitors available. However, if you are about to install a color graphics board, you will probably want to add a color monitor to your system.

Color monitors come in two varieties: composite color and Red Green Blue (RGB) color. The difference between the two is the quality of the picture and the price.

Both monitors use three electron guns to shoot a stream of electrons to the phosphor-covered screen. One gun turns on red phosphors, one gun turns on green phosphors, and the third gun turns on blue phosphors. The big difference between a composite and RGB monitor is the signal used to control these guns.

A composite monitor works like a TV set. The monitor receives a video signal conforming to National Television System Committee (NTSC) protocols. It uses one signal to control all three guns.

An RGB monitor uses three signals, which means each gun is controlled by a separate signal. Herein lies the quality difference. Three signals transmit color intensities more precisely, producing higher resolution and sharper images. Thus, RGB monitors display clearer images than composite monitors. Of course, high resolution carries a higher price. RGB monitors cost more than composite monitors.

Backing up a hard disk is not as easy as backing up a floppy.

Just as graphics boards have an upper limit on pixel resolution, so do composite and RGB monitors. In general, the higher the resolution, the sharper the image.

When purchasing a color graphics board and monitor, you should be sure they are compatible. Both must be either composite (NTSC) or RGB. While some graphics boards boast color resolution of 640 x 400 pixels, many monitors are unable to display this resolution. Remember, the final output will be no better than the weakest link in the chain.

Keyboards

The biggest complaint people have about the IBM PC is its keyboard. The idea of making it detachable from the

What made over 100,000 Apple II owners fall in love with System Saver?

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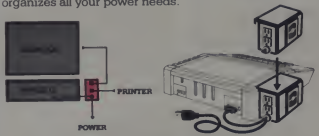
No more reaching around to the back of your Apple to turn it on. No more fumbling for outlets and cords to plug in your monitor and printer. System Saver organizes all your power needs.



It functions as a multi-outlet power strip with two switched outlets. Plus System Saver offers the ultimate convenience: a front mounted power switch for fingertip control of your entire system.

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© 1984 Kensington Microware Ltd System Saver is patent pending

system unit is brilliant, and the 10 function keys make it very flexible. The keys have a nice, solid feel, and the aural feedback is marvelous. But, and this is a very big but, the layout of the QWERTY keyboard is rumored to have driven more than one touch typist to drink.

Frankly, most people adapted to the idiosyncrasies of the keyboard because they had no other choice. However, for those who want a different keyboard for their PC, several companies manufacture replacement keyboards.

The most important feature to "look" for is the feel of the keyboard. Keystrokes are divided into two groups of tactile sensations, hard and soft. The hard touch, which the IBM PC uses, is much like a typewriter; you must depress the key fully to input a character. The soft touch, which many of the replacement keyboards use, requires only a light tap on the key to input a character. This gives the keyboard a mushy feel, but also increases typing speed. If you switch from a hard to a soft touch, plan on taking a few hours to get used to the change.

IBM takes a lot of heat about the layout of the PC keyboard, and rightly so. Instead of using their own "Selectric standard" layout, IBM uses an altered layout, inserting extra keys where they are not expected and moving the Return key. To make matters worse, IBM labels the Return, Shift, Tab, and Backspace keys with arrows instead of words.

Most replacement keyboard manufacturers have put the keys back in their correct positions.

Most replacement keyboard manufacturers have put the keys back in their correct positions and label the Return, Tab, Backspace, and Shift keys as such. Furthermore, many manufacturers also put LED indicators on the Num Lock and Caps Lock key to tell you whether they are on or off. Some even place raised bumps on the J and F keys to help touch typists keep their place on the keyboard.

A good feature to look on a replacement keyboard is a separate set of cursor control keys. IBM makes the cursor keys double as the numeric keypad. While this is an adequate arrangement, a separate set of cursor keys, preferably arranged in a logical diamond formation, allows you to manipulate the cursor faster. The better keyboards also place special text editing keys like insert and delete either above or below the cursor keys.

The numeric keypad should have a raised bump on the 5 key. Like the bumps on the J and F key, this tactile feature helps you keep your place on the keypad and speeds data entry.

One last point. Current ergonomic theory places the function keys in a row over the QWERTY keys. Some users like the function keys there, some do not. It depends on personal preference.

Plug-In Graphics Boards for the IBM PC

Manufacturer	Board Name	Color Monitor	16-Color Resolution	Monochrome Monitor
ABM Computer Systems 3 Whainey Irvine, CA 92714 (714) 859-6531	Color Graphics Subsystem Col-Mon	Yes No	320 x 200 No	No Yes
AST Research 2121 Alton Irvine, CA 92714 (714) 863-1333	MonoGraph Plus	No	No	Yes
Amdek Corp. 2201 Lively Blvd. Elk Grove Village, IL 60009 (312) 364-1180	MAI	Yes	320 x 200	Yes
Applied Computer Products 1916 Welsh Rd. #6 Philadelphia, PA 19115 (215) 934-6990	Biographix I Biographix II	Yes Yes	320 x 200 640 x 400	Yes Yes
Everex Systems Inc. 891 Maude Ave. Mountain View, CA 94043 (415) 967-1495	Color Pacer Graphics Pacer Graphics Edge	Yes No Yes	640 x 200 No 640 x 200	No Yes Yes
Hercules Computer Technology 2550 Ninth St. Berkeley, CA 94710 (415) 540-6000	Graphics Card Color Card	No Yes	No 640 x 200	Yes No
Mylex 5217 NW 79th Ave. Miami, FL 33166 (800) 446-9539	Chairman	Yes	320 x 200	Yes
Paradise Systems Inc. 150 N. Hill Dr. Brisbane, CA 94005 (415) 468-6000	Multi-Display	Yes	320 x 200	Yes
Plantronics 1751 McCarthy Blvd. Milpitas, CA 95035 (408) 945-8711	Color Plus	Yes	320 x 200	No
Profit System Inc. P.O. Box 1039 Berkeley, MI 48072 (313) 647-5010	Multigraph	Yes	640 x 400	Yes
Quadram Corp. 4355 Industrial Blvd. Norcross, GA 30093 (404) 923-6666	Quadcolor I Quadcolor II	Yes Yes	320 x 200 320 x 200	No No
STB Systems Inc. 601 N. Glenview Richardson, TX 75081 (214) 234-8750	Graphix Plus	Yes	640 x 200	Yes
Tecmar 6225 Cochran Rd. Cleveland, OH 44139 (216) 349-0600	Graphics Master	Yes	640 x 400	Yes

Monochrome Resolution	Monochrome Graphics	Parallel Port	Light Pen Interface	Software	Suggested Retail price	Comments
No	No	No	No	Yes	$349	4 Color only
640 x 200	Yes	No	No	No	$98	Plugs onto back of IBM or ABM graphics card
720 x 348	Yes	Yes	Yes	Yes	$545	Includes serial port
640 x 200	Yes	Yes	Yes	Yes	$799	
640 x 200	Yes	Yes	Yes	No	$595	
720 x 700	Yes	Yes	No	No	$295	Piggybacks onto Biographix I
No	No	Yes	Yes	No	$389	
720 x 348	Yes	Yes	Yes	No	$389	
720 x 348	Yes	Yes	Yes	No	$499	
720 x 348	Yes	Yes	No	Opt.	$499	Optional software $50
No	No	Yes	No	No	$245	
320 x 200	Yes	Yes	No	Yes	$595	
640 x 200	Yes	Yes	Yes	No	$595	
No	No	Yes	Yes	Yes	$559	
720 x 700	Yes	Opt.	No	No	$499	Optional port $65
No	No	No	Yes	No	$295	
No	No	No	No	Yes	$275	Includes game port Piggybacks onto Quadcolor I
640 x 200	Yes	Yes	Yes	Yes	$495	
720 x 700	Yes	No	Yes	No	$695	

Of course, the more function keys the merrier, although software may not acknowledge extra keys.

The Bottom Line

Almost all of the peripherals mentioned here are available from mail order houses at a discount from the suggested retail price. Although you must install them yourself, the substantial savings may offset the effort.

On the other hand, as we have discussed many times on these pages, dealing with a local retail store means that the burden of making your system work falls to someone else. Furthermore, you have a place to which to return it should it malfunction in the future.

Either way, upgrading an IBM PC is a reasonably painless and very rewarding task. With boards, drives, and keyboard installed, you can now run all the popular, sophisticated, and entertaining software available for the IBM PC. ■

Making The Upgrade

Russ Lockwood

Installing memory boards, graphics boards, and disk drives is easy, quick, and requires only a few simple tools. You can buy these peripherals direct from the manufacturer or from a mail-order house, which may save you some money over a retail purchase and installation.

Sounds great. You get the same product at a lower price. But suppose your digital dexterity prevents you from assembling a two-piece jigsaw puzzle? How are you going to cope with micro-sized components with your macro-sized fingers?

Not to worry. Using only a pair of pliers, a screwdriver, and a pen, even those with less than nimble fingers can replace a disk drive and insert a memory or graphics board easily.

Remember, always refer to the manuals and documentation supplied by the manufacturer when installing the equipment yourself. Also, use the appropriate sections in the IBM Guide to Operations. The procedure we followed applies to specific expansion boards and disk drives, although the same general guidelines apply to all boards and drives.

A Word to the Wise

Although this should go without saying, when you are putting in expansion boards, disk drives, or anything else, make sure the IBM PC is unplugged from the wall socket, all cables are disconnected, and you have a large, clear space all around the machine. Do not rush through the procedures. Take your time upgrading your system. Haste makes waste, you know.

Floppy Disk Drives

Disk drives are easy to put in. They are held to the system unit by two screws. Our PC had two Phillips head screws holding the B drive, but for some reason, the A drive was held on by two bolts. In addition, each drive has two cables attached, one from the disk controller card and one from the power supply. The flat disk controller cable (ours was colored gray) is attached to the right rear of the drive. The power supply cable consists of multicolored wires that end in a plastic cap with four holes. The cap plugs into a plastic socket at the left rear of the drive, just underneath the top of the drive board.

Taking out the disk drives entails removing the screws or bolts, detaching both cables, and sliding the drive out the front of the system unit. To put a disk drive in, you simply perform these steps in reverse order.

A Trick of the Trade

When we replaced our drives, the power supply cable was very difficult to remove. In fact, it was holding onto the disk drive for dear life. Most people try rocking the cap to loosen it. That is a good strategy; it sure beats putting your foot on the drive and yanking. However, if the power supply cable still holds on as if some joker had put superglue in the socket, try pressing the cap back into the socket. Not only is this good reverse psychology, it also helps loosen the cap from the socket.

Suppose your digital dexterity prevents you from assembling a two-piece jigsaw puzzle?

Half height disks pose a different problem. They are a bit more difficult to install than full sized disk drives. Both our old and the new ones we installed were full height, so the switch was very easy. Again—and we cannot emphasize this enough—look at the documentation that comes with your drives. That is what it is for.

Slippery Chips

Although your two disk drives are installed, they will not work properly until you alter a couple of chips. On our two-drive system, we had to pull out a terminator chip on the B drive, and punch out six of the seven hour glass connectors on another chip (sometimes referred to as a bridge) on both the A and B drives. Again, look at the documentation. The manufacturer explains these important procedures in detail.

If you originally had two single sided disk drives and have replaced them with two double sided disk drives, you do not have to change the DIP switches in switch box 1 on the motherboard. If you had one disk drive and now have two, you must change DIP switches 1, 7, and 8 in switch box 1. Consult your IBM Guide to Operations manual for the correct positions.

The Boards

The memory and graphics boards are much easier to install than the disk drives. They simply plug into expansion slots on the motherboard and require a few DIP switch changes.

Most expansion boards contain DIP switches, which are usually preset by the manufacturer. If they do need changing, consult the instruction booklet that comes with the boards for the exact settings. The switches are easily changed with the point of a pen.

Likewise, you must change the DIP switch settings on the PC motherboard. Again, check the instruction booklet for the exact settings.

The PC has five expansion slots in the left rear of the system unit. Pick one that is empty, unscrew the bolt holding the expansion slot cover, position the expansion board over its assigned slot, and press it into the slot. A connector on the bottom of the board will slide into the slot. For best cooling, use every other slot for your first three add-on boards. With four or five boards, alternate short or lightly-populated boards with long boards.

Hard Disk Drives

Putting in a hard disk drive is like putting in a floppy disk drive and an expansion board. Inserting the drive itself is just about the same as putting in a floppy drive. Of course, external drives are not mounted inside the system unit. In addition, you must install a disk controller board for the hard disk drive.

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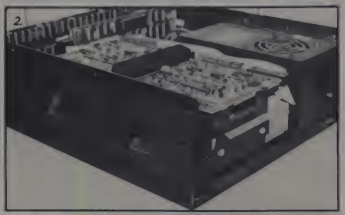


1. The rear of the IBM PC system unit, with the cover mounting screws removed.

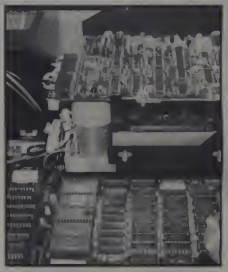
2. The IBM PC exposed.

3. The cap has been carefully removed from the socket, located underneath the left rear corner of the disk drive board.

4. The B drive halfway removed. Note the two screws have been taken out and the power and disk controller cables disconnected.

5. The IBM PC with disk drives and memory board installed. Note chips are not yet altered.

6. The expansion slot, with the cover still attached.



This board installs just like an expansion board, and the disk controller cable attaches to the hard disk drive. If the drive is externally mounted, the cable goes out the back of the system unit.

The Keyboard Shuffle

Replacing the keyboard takes all of about 10 seconds. Simply pull the plug of the original keyboard out of the back of the system unit and plug in the new keyboard. Not sure which plug? Look for the one labeled "keyboard."

Color Monitor

Replacing your old monitor with a color monitor is almost as easy as replacing the keyboard. This time, you encounter two plugs instead of one. One monitor plug goes into a port on the graphics board, and the other plug goes into a wall socket. Just make sure you plug a color monitor into a color graphics board.

Parting Pointers

Above all, read the documentation from the manufacturers. Repeat, read the documentation from the manufacturer. If you still question the procedure, call the manufacturer. They are friendly and generally helpful, and you are assured of getting the most up-to-date and correct information available.

Installing disk drives, expansion boards, keyboards, and monitors is a simple procedure. It does not take a great deal of dexterity, and you can save a bundle doing it yourself with only a screwdriver, pliers, and a pen. ■

What's New In Hardware

Otrona 2001

Otrona Advanced Systems introduces the Otrona 2001. Said to be a 100 percent IBM-PC compatible computer that can be easily converted from a desktop model to a portable, it runs the MS-DOS and PC-DOS operating systems and all IBM software can be used off-the-shelf.

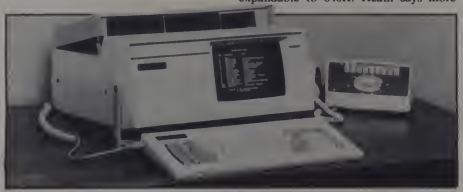
The 2001 measures 15" x 14" x 7" and weighs in at 19 pounds. It comes with 128K RAM, expandable to 640K; an Intel 8088 microprocessor, the same used in the IBM PC; one 5.25" 360K disk drive, with provision for a second floppy drive or a 10 Mb hard disk drive; a built-in tilting 7" amber flat screen, which can be replaced with either a 13" color or 12" monochrome monitor for desktop use; a 84-key detachable keyboard; and one RS-232 serial port and one parallel port.

The 2001 supports an Intel 8087 numeric co-processor, and has three expansion slots. Additional options include a Z80B microprocessor board running the CP/M operating system, a battery pack, and internal 1200/300 baud modem. The Otrona 2001 carries a suggested retail price of $2495.

Otrona Advanced Systems Corp., 4725 Walnut St., Boulder, CO 80301. (303) 444-8100.

CIRCLE 430 ON READER SERVICE CARD

Heathkit HS-161 Portable Personal Computer



Heathkit announces the HS-161 Portable Personal Computer, a portable IBM PC-compatible computer kit. Like the IBM PC, the HS-161 uses a 16-bit Intel 8088 microprocessor, runs the MS-DOS operating system, and comes with 128K RAM, expandable to 640K. Heath says more than 175 software packages were tested to insure compatibility.

Other features include two half-height 5.25" 360K floppy disk drives located in a pop-up housing, a built-in 9" amber screen, a detachable keyboard, two RS-232C serial ports, and one parallel port. Four expansion slots accommodate IBM-compatible expansion boards.

The HS-161 Portable Personal Computer measures 19.5" x 19.1" x 8.4" and weighs 35 pounds. An assembled version of the HS-161 is available and carries a suggested retail price of $2799 with one floppy disk drive and $3199 with two disk drives. Kit prices have not been released yet, but based on previous pricing patterns, should be roughly $700 to $800 less than the price for an assembled HS-161.

Heath Company, Benton Harbor, MI 49022. (616) 982-3200.

CIRCLE 431 ON READER SERVICE CARD

Tava PC and Turbo Tava PC

The Tava PC desktop model looks like an IBM PC with a Tava label. It comes with 16-bit 8088 microprocessor operating at 4.77 MHz, 64K RAM, expandable to 640K, two 360K floppy disk drives, five expansion slots, one parallel port, two serial ports, detachable keyboard, monochrome adapter board, and green or amber screen monitor. An additional 64K RAM costs $60, and no software is bundled with the system. An optional hard disk drive is available.

The Tava PC runs MS-DOS 1.1, 2.0, and 2.11, CP/M-86, and UCSD p-System. Tava claims all the popular programs run on the computer, including *WordStar*, *SpellStar*, *MailMerge*, *dBase II*, *Lotus 1-2-3*, *Multiplan*, and *VisiCalc*. The Tava PC carries a suggested retail price of $1995.

The Turbo Tava PC is a Tava PC with an 8 MHz 8088-2 microprocessor that runs software 68 percent faster than the regular Tava PC. The Turbo Tava PC retails for $2495.

Tava Corp., 16861 Armstrong, Irvine, CA 92714. (714) 261-0200.

CIRCLE 432 ON READER SERVICE CARD

Compaq Introduces Four Desktop Computers

Compaq has introduced the Deskpro family of desktop computers said to be able to run all software and hardware developed for the IBM PC without modification. The Model 1, Model 2, Model 3, and Model 4 all feature a 16-bit 8086 microprocessor, 128K RAM expandable to 640K, one 360K floppy disk drive, and a green or amber screen monochrome monitor. All run the MS-DOS operating system. Different models offer varying amounts of RAM and different types of storage.

The monitor displays high-resolution graphics without the use of a separate graphics board. The computers include six IBM-compatible expansion slots, one parallel port, and interfaces for a RGB color monitor, composite monitor, and RF modulator.

The Compaq Deskpro models carry a suggested retail price of $2495 and up.

Compaq Computer Corp., 20333 FM149, Houston, TX 77070. (713) 370-7040.

CIRCLE 433 ON READER SERVICE CARD

Key Tronic Keyboards

Key Tronic has released new plug-compatible keyboards for the IBM PC and DEC VT-100, and a replacement keyboard for the Radio Shack TRS-80 Color Computer.

The KB-5151 keyboard for the IBM PC carries a suggested retail price of $255. The KB-100 for the DEC VT-100 carries a suggested retail price of $379. The KB-500 for the Color Computer sells for $89.95.

Key Tronic, P.O. Box 14687, Spokane, WA 99214. (509) 928-8000.

CIRCLE 434 ON READER SERVICE CARD

Two New Protection Devices

Back in the May 1984 issue, we did a roundup of devices for power line protection. Since then, Computer Power Solutions, Inc. has introduced one of the most compact protection devices, the Electra Guard 3.

The Electra Guard 3 is a single grounded plug adapter which provides both line-to-line and line-to-ground clamping protection against spikes and transients. It has a fast response time of less than five nanoseconds and a forward surge rating of 1440 amperes.

The Electra Guard 3 also provides EMI/RFI noise rejection from 150KHz to 300MHz. It comes in either a white or transparent housing and retails for $18.95.

Computer Power Solutions also makes surge suppressor and filtering devices and a standby power supply.

Computer Power Solutions Inc., 8800 49th St., North, Suite 203, Pinellas Park, FL 33565. (813) 544-8801.

CIRCLE 435 ON READER SERVICE CARD

Another surge suppressor recently introduced is the SpikeMaster from Discwasher, the record care people. The SpikeMaster provides four protected sockets spaced widely enough for use with bulky AC power adapters. All four sockets are numbered and controlled by a lighted red rocker switch.

In addition to filtering out RF interference, the SpikeMaster provides both multistage and multimode protection. A circuit breaker is built into the unit to prevent dangerous line overloads from reaching precious equipment.

The SpikeMaster surge suppresor comes with a limited 90-day warranty and retails for $79.95.

Discwasher, 1407 N. Providence Rd., P.O. Box 6021, Columbia, MO 65205. (314) 449-0941.

CIRCLE 436 ON READER SERVICE CARD

Internal Modem for IBM PC and Compatibles

The Popcom C100, a new internal 300 and 1200 baud modem from Prentice, features automatic voice and data switching, automatic dial, and full compatibility with AT&T 103, 113, and 212A dial-up modems. The C100 retails for $445.

Prentice Corp., 266 Caspian Dr., P.O. Box 3544, Sunnyvale, CA 94088. (408) 734-9810.

CIRCLE 437 ON READER SERVICE CARD

USI Monochrome Monitors

USI Computer Products introduces four monochrome monitors for Apple, Atari, Commodore, IBM, and other computers.

The 900 series monitors are 9" screens displaying 24 lines of 80 characters with a

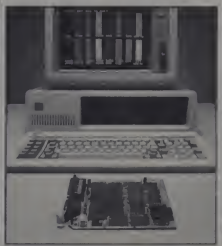
horizontal resolution of 1000 lines at the center. The 1200 series monitors are 12" screens displaying 24 lines of 80 characters with a horizontal resolution of 800 lines. Suggested retail price for 900 and 1200 series green screen is $199, and for the 900 and 1200 series amber screen, $225.

USI Computer Products, 71 Park Lane, Brisbane, CA 94005. (415) 468-4900.

CIRCLE 438 ON READER SERVICE CARD

Color Graphics Board for IBM PC

Hercules Computer Technology has introduced the Color Card, a color graphics board matching the performance of the IBM Graphics Monitor/Adapter.



The Color Card supports either a RGB or composite color monitor and includes a parallel port not found on the IBM board. The Color Card carries a list price of $245.

Hercules Computer Technology, 2550 9th St., #210, Berkeley, CA 94710. (415) 540-6000.

CIRCLE 439 ON READER SERVICE CARD

Hi-Res Graphics Board for TRS-80 Model III and 4

Micro-Labs has introduced the Grafyx Solution, an add-on graphics board for the TRS-80 Model III or 4 that displays a resolution of up to 640 pixels x 200 pixels.

The board comes with graphics software compatible with TRSDOS 1.3 and 6.1, LDOS, NEWDOS 80, and DOSPLUS. The software adds over 20 commands to Basic and contains over 40 graphics programs. The Grafyx Solution and software carry a suggested retail price of $199.95.

Micro-Labs Inc., 902 Pinecrest, Richardson, TX 75080. (214) 235-0915.

CIRCLE 440 ON READER SERVICE CARD

Interfirm Systems Digit-Ball

Interfirm Systems has released Digit-Ball, a trak-ball for the IBM PC and Apple II. The Digit-Ball emulates resistive joysticks and analog touch tablets, can wrap around screen edges, and comes in handheld and desktop models. Suggested retail price for the IBM PC version is $119.95. The Apple II version sells for $99.95.

Interfirm Systems Corp., 1899 Montford Ct., San Jose, CA 95132. (408) 923-3338.

CIRCLE 441 ON READER SERVICE CARD

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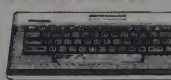
HOME COMPUTERS



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CIRCLE 122 ON READER SERVICE CARD

In one of the most dramatic new product introductions on either side of the Atlantic, ACT recently unveiled four new Apricot computers, thus making the Apricot line one of the most complete from any manufacturer.

Prior to the launch, ACT distributors were flown up to the ACT plant in the new town of Glenrothes, Scotland. This particular area of Scotland—from northeast of Edinburgh running west along the Firth of Forth—has come to be known as Silicon Glen, and is the home for much of the U.K.'s computer industry. As a result, a highly skilled and motivated labor force has gravitated to the area, much as has happened in the San Francisco Bay area.

The year-old ACT plant is a model of efficiency, and, although it is not as highly automated as some Japanese and American factories, quality control is second to none. In contrast to Far Eastern factories, the work floor is open, airy, and relatively quiet. As the government requires a certain amount of space per worker, even after gearing up to make the new machines, the plant should retain its nonclaustrophobic atmosphere.

ACT Concert in Royal Albert Hall

No, it wasn't the Proms—an extremely popular classical concert series held toward the end of the summer—but more than a few Londoners wondered just what *was* going on at Royal Albert Hall on June 28th. ACT called it "the most remarkable event in the history of the British microcomputer industry," and perhaps it was. More than 2500 U.K. computer dealers, international distributors, and members of the press were present at 12:00 noon for an extravaganza of light and sound, dancing girls, comedians, a midget, and, oh yes, four new computers.

Since you are not reading *Creative Computing* to learn about multimedia shows and champagne lunches, let's talk computers. Perhaps the most significant aspect of the launch is the fact that ACT now offers a complete, upward-compatible line of 16-bit computers and is, as far as we know, the only manufacturer in the world to do so (see table). The only significant parts of the market in which ACT does not have an entry are the home and notebook portable segments. And if you believe Roger Foster, managing director of ACT, ignoring these sectors is quite deliberate.

The significance of having a complete family cannot be overemphasized. Besides providing buyers with some very attractive machines to consider, a compatible line makes the initial decision as to which computer to buy much less critical. You can select the machine that is best for your school or business today secure in the knowledge that as your requirements increase, so can your Apricot expand.

F1 Entry Level Business System

The Apricot F1 has a 16-bit 8086 microprocessor running at 4.77 MHz (as does the entire Apricot line), 256K of RAM (expandable to 768K), double-sided, 3½" floppy disk drive (Sony type) with 720K of storage, a cordless infra-red full-stroke keyboard, color graphics, and RS-232 and Centronics interface ports.

The keyboard is a European-style unit with square keys having a rounded depression in the top of each one. One can get used to it in a few hours. The unit is a longish 17.7" x 8.7" wide. It has 92 keys with a numeric keypad and ten function keys at the right side.

In addition to the keyboard, ACT also offers a wireless mouse (a mouse without a tail?). Moreover, the mouse can be used upside down as a trackball which, if your desk is as cluttered as mine, could be a considerable plus. The mouse has two buttons, one on each side, and is fully compatible with the Microsoft mouse.

The system unit houses the electronics and single disk drive. This compact unit has a single expansion slot which most likely would be used for memory. In addition, an external expansion box with five more slots is available; this box can also hold a second 3½" drive or a 5¼" one.

The F1 drives practically any kind of display: RGB monitor, composite video monitor, or standard TV set. Graphics resolution is 640 x 256 pixels (four colors) or 320 x 256 pixels (16 colors). Resolution on U.S. NTSC displays will be 640 x 200 and 320 x 200. Text resolution is the expected 80 characters by 25 lines.

To increase system performance, the F1 basic input/output system (BIOS) has been implemented in 32K of ROM. The BIOS handles communication with all devices connected to the computer, and putting it in ROM reduces the amount of space required by the operating system, which leaves more memory for applications software and user programs.

The bundled software with the F1 includes the MS-DOS operating system; Sorcim *SuperCalc*, *SuperWriter*, and *SuperPlanner*; ACT *Diary*; ACT *Sketch* (an easy-to-use drawing tool with a wide range of handy features); the Apricot *Tutorial*; and even a challenging strategy game. Many of the software packages make extensive use of icon and window technology and can be accessed by either the keyboard or the mouse.

For multi-user applications, Concurrent DOS (formerly Concurrent CP/M) is also available. Other optional packages include CP/M-86, GW Basic, Personal Basic, GSX graphics system, and Dr. Logo.

F1e Education System

The F1e education system is a cut-down version of the F1. Although it is aimed at the education market, frankly we don't see any reason at all that this wouldn't have appeal for the serious home user as well.

Physically, the system appears identical to the F1. However, it has only 128K of RAM and a single-sided disk drive (315K of storage); everything else is the same as the F1 in the hardware.

The software bundled with the F1e includes CP/M-86, Personal Basic, and Dr. Logo.

The F1e can be upgraded into an F1 with a "Business Upgrade Kit" which

Market Segment	ACT System	Competitors
Home	None	Commodore 64 Color Computer
Education	FIe	Apple IIe Acorn (BBC)
High-end Home Low-end Business	FI	Apple IIe
Notebook	None	Tandy Model 100, et al.
Full-function Portable	Portable	Compaq IBM Portable
Desktop	Apricot PC	IBM PC
Desktop, Mass Storage	Apricot Xi	IBM PC XT
Multi-user	Point 7 Point 32	Altos 68000 Unix systems

includes additional memory, an expansion box, MS-DOS, and business software packages.

State-of-the-Art Portable

An interesting half step up and half step to the side from the FI is the Apricot Portable. Weighing less than 13 pounds, the Portable features a full-size 80 x 25 character (640 x 256 pixels) flat screen LCD display, cordless keyboard and mouse, and built-in speech recognition unit. Other hardware specifications are the same as the FI. Incidentally, the machine does not run on batteries.

Technologically, the speech recognition unit is probably the most interesting. It is manufactured by Dragon Systems of West Newton, MA and uses a microphone cradled on the right of the display. It can have a vocabulary of 4096 words of which 32 can be active at a time. ACT furnishes voice-driven versions of ACT *Diary* and ACT *Sketch* with the computer. It is uncanny to speak to the computer with a phrase such as "Print all appointments starting after 1:00 p.m. next Monday" and see an appointment list appear on the screen. The *Diary* package itself is quite amazing with separate windows for a calendar, appointment schedule, and detailed descriptions of individual appointments.

The 25 line by 80 character LCD screen is made by Sharp. Although several manufacturers have talked about the product, only ACT and Apple (for the IIc) have actually announced its availability. Interestingly, the LCD screen can be used simultaneously with a color (or monochrome) monitor. With this combination, it is possible to run two applications on the two screens simultaneously using the windowing software. Or, when using a package like *SuperCalc 3*, text can be shown on the LCD screen while graphics are displayed on the color monitor.

The LCD screen is supported by a separate 16K memory module and a custom IC. With the LCD screen on, the color screen can display 640 x 256 pixel graphics in eight colors; with the LCD screen off, 16 colors can be displayed.

In common with the F1, the Portable has an expansion slot for additional memory, and it may also be upgraded with a 10Mb Winchester hard disk.

Apricot and Apricot Xi

The Apricot and Apricot Xi (hard disk version) computers are unchanged from the originals (see *Creative Computing*, Feb. 1984 for a complete review). They are furnished with 256K; a 96-key full-stroke keyboard with a two-line, 40-character LCD display; internal battery-powered clock/calendar; TI sound chip; serial and parallel ports; dual 3½" Sony disk drives; high-resolution monochrome display; and MS-DOS.

We were especially impressed with the Manager overlay on the operating system which makes using the Apricot a joy for a novice as well as an experienced user. The system also includes the same excellent range of bundled software packages as the F1. Concurrent with the ACT announcement of the new computers, Lotus Development Corp. announced that *Symphony* would be available for the Apricot. *Symphony* is an integrated package including spreadsheet, database, word processing, and graphics software.

Point 7 Clustered System

The Apricot Point 7 is an upward extension to the existing Apricot Xi. It includes 512K of RAM, a 10Mb Winchester hard disk, a double-sided 3½" floppy disk, and a six-terminal cluster controller.

The cluster controller allows Apricot, Sirius, and IBM PC computers to be used as stand-alone systems and as intelligent workstations accessing the host Point 7's Winchester disk. In the latter mode, the Point 7 and its terminals act as a multi-user system running under Multi-user Concurrent DOS. The ability of each terminal to function as a stand-alone computer reduces congestion on the cluster controller and enhances performance. Terminal computers must be located within 50 feet of the host system.

Software for cluster use furnished with the Point 7 includes the ACT *Diary* package which permits a group diary to be maintained, and the Pulsar integrated accounting package. Pulsar also plans to make other packages in their line available for the Point 7.

Local Area Network System

The Apricot Point 32 is a local area network system that allows up to 32 Apricot, Sirius, or IBM PC computers to gain access to up to 200Mb of mass storage, with the added security of cartridge tape backup. The system uses a device called The Bank and Omninet card made by Corvus. The software is a new system developed by Microsoft called MS-NET.

The heart of the Point 32 is an enhanced 10Mb or 20Mb Apricot with ACT LAN (local area network) cards. This acts as a file server to a network of personal computers linked via the Omninet card. Up to ten file servers can be included in the network. Computers in the net can be located up to 2000 feet from the host.

Pricing and Availability

U.S. prices have not yet been set on the new Apricot line, but judging from the U.K. prices, the line will be priced very aggressively. At the current rate of conversion, the F1e would sell for about $1200 and the F1 for about $1500. These prices do not include shipping or import taxes so the final prices will be somewhat higher.

Micro-D has just signed a contract with ACT to be the exclusive U.S. distributor. Given Micro-D's excellent coverage of the market, you can expect to see Apricots on the shelves of a wide cross section of stores throughout the country.

ACT promises that the new computers will begin shipping in about 60 to 75 days to the home market. That means they probably will not hit these shores until early 1985. Frankly, we can't wait! – *DHA*

ACT (North America) Inc., 3375 Scott Blvd., Suite 336, Santa Clara, CA 95051. (408) 727-8090.

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What's New In Software

TI Professional Software

TEXAS INSTRUMENTS

Texas Instruments releases HowardSoft's *Tax Preparer*, a tax planning and preparation program, for the TI Professional computer. *Tax Preparer* maintains tax records throughout the year and prints IRS-accepted forms for 21 commonly used filing schedules. Suggested retail price is $295.

Texas Instruments also introduces a high-speed MS-Basic compiler running under the MS-DOS 1.1 or 2.1 operating system for the TI Professional computer and the TI Portable Professional computer. Suggested retail price is $300.

A new communications software package, the 3101, allows the TI Professional and Portable Professional computers to emulate an IBM 3101 Display Terminal. The 3101 supports a character mode to access and retrieve information from databases and timesharing services, and a block mode to access remote computers for order entry, inventory, and other applications. Suggested retail price is $140.

Texas Instruments, P.O. Box 402430, Dallas, TX 75240. (800) 527-3500.

CIRCLE 443 ON READER SERVICE CARD

Overhead Express

Business & Professional Software introduces *Overhead Express*, a graphics software package to produce overhead transparencies on the IBM PC and compatibles. It includes international characters, various symbols, four different typefaces, and 12 prefabricated templates. *Overhead Express* requires 192K RAM and retails for $195.

Business & Professional Software, 143 Binney St., Cambridge, MA 02142. (617) 491-3377.

CIRCLE 446 ON READER SERVICE CARD

Atari Software

OSS

Optimized Systems Software releases three new programs for Atari computers.

Postal and Sort Tool is a mailing list program with a sort function. It requires 48K RAM and either a double sided disk drive or two single sided disk drives. It comes on disk and carries a suggested retail price of $59.95.

Write Tool is a full-featured word processor requiring 16K RAM. It comes on cartridge and costs $49.95.

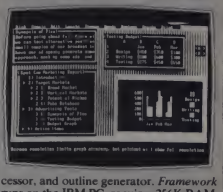
Print Tool adds professional features to a word processor, including indexing, outlining, footnotes, and table of contents. *Print Tool* requires 48K, comes on disk, and carries a suggested retail price of $59.95.

Optimized Systems Software Inc., 1221B Kentwood Ave., San Jose, CA 95129. (408) 446-3099.

CIRCLE 444 ON READER SERVICE CARD

Ashton-Tate Framework

Ashton-Tate has released *Framework*, an integrated software package including a word processor, spreadsheet, business graphics, data management, forms processor, and outline generator. *Framework* runs on the IBM PC, requires 256K RAM, and supports graphs and text on a monochrome monitor. Suggested retail price is $695.



Ashton-Tate, 10150 W. Jefferson Blvd., Culver City, CA 90230. (213) 204-5570.

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Integrated Software

Computer Creations presents *The Ultimate*, an integrated software package containing word processor, dictionary, database, mail merger, and communications link to the US Postal Service's Electronic Computer Originated Mail (E-COM) service. *The Ultimate* requires 96K RAM under DOS or 64K under CP/M and two disk drives. A modem is required for E-COM service. Suggested retail price is $249.50.

Computer Creations Inc., 766 El Camino Real, San Carlos, CA 94070. (415) 595-4466.

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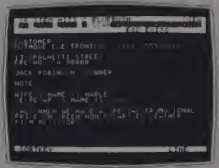
NEW PRODUCTS

Speed File from Bluebush



Bluebush is shipping *Speed File*, its free form filing program for the Apple II+ and IIe. *Speed File* sorts on any field, offers optional password protection, and makes automatic backups of data. Suggested retail price is $125.

Bluebush, 3379 St. Mary's St., Santa Clara, CA 95051. (408) 244-1631.

CIRCLE 448 ON READER SERVICE CARD

MASS-11pc Word Processor

Microsystems Engineering releases *MASS-11pc*, a full-featured word processor, spelling checker, and index generator for the DEC Rainbow, IBM PC, and Tandy 2000 computers. *MASS-11pc* requires 256K RAM and also ties into *MASS-11*, which runs on DEC Vax minicomputers. Suggested retail price is $995, with volume and educational discounts.

Microsystems Engineering Corp., 2400 W. Hassell Rd., Suite 400, Hoffman Estates, IL 60195. (312) 882-0111.

CIRCLE 449 ON READER SERVICE CARD

HP-150 Word Processor

Lexisoft releases *Spellbinder*, a combination word processor, spelling checker, and grammar checker for the HP-150 computer. The grammar checker looks for double negatives, wordy phrases, and misused words, then suggests ways to correct the sentence. *Spellbinder* uses the touch screen and can interact with popular databases, spreadsheets, and accounting software. Suggested retail price is $495.

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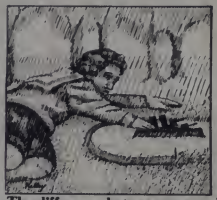
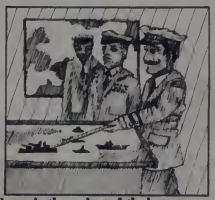
War and Games

Earl Vickers

War and games are both ancient inventions of undying popularity. They continue to evolve side by side, each influencing the other and together forming a reflection of the societies from which they arise. War is not a game, nor are games wars, strictly speaking, but the analogy is often useful.





The difference between men and boys is the price of their toys.

Games as War

Many games, ancient and modern, are modeled after the wars of the same era. Chess, for example, is an offshoot of a game called Chaturanga, Sanskrit for "the army game." The pieces and their movements are symbolic of elements of fifth century Indian armies, and some historians believe the game to have been developed as a "moral equivalent" to war by pacifist Brahmans. Variants of chess were used by seventeenth century military planners.

A game which is older than chess and at least comparable in depth (and much more difficult to program on a computer) is the oriental game, Go. (The name "Atari" comes from a move in this game.)

By the thirteenth century Go was considered a vital part of a Samurai warrior's education. It was taken along on military expeditions, and as soon as the battle was over the game would begin. The Chinese leader Mao Tse-tung used the game to illustrate his strategies of guerrilla warfare, and a book has been written extending the comparison.

War Games

The use of games for military planning probably dates back almost as far as war or games individually. War being a very complex and uncertain affair, it is reasonable to look for some kind of interactive model of the actions and reactions, measures and countermeasures of war. Games are an obvious choice.

The Japanese use of war games in the Russo-Japanese war is considered one of the main reasons for their victory. They also used war games to rehearse Pearl Harbor. The German use of gaming was less successful, leading to the disastrous World War I invasions of Belgium and France. During the past century, the use and sophistication of war games has steadily increased right up to Vietnam, the most gamed and most analyzed war in history.

One fairly simple combat simulator of recent years was an adaptation of Battle Zone, modified by Atari at the request of the U.S. Army to include realistic controls and likenesses of U.S. and Soviet tanks. A more advanced war game, perhaps the world's most powerful, is the Army's Janus. Created at Livermore National Laboratory in California, it is said by its designers to be "light-years ahead of any Atari game." Upon request, its color graphics will display the topographical features of any 15 square mile area on Earth. The game usually starts with Russian tanks rolling into West Germany and often ends, if the going gets tough, with the tough going nuclear. The military plays such war games frequently, and the U.S. usually "wins."

Limitations of War Games

History points out some dangers of the careless use of war games, the main one being that players tend subconsciously to bend the outcomes to convince themselves of the validity of their own underlying assumptions. In World War I, Kaiser Wilhelm would show up at war games dressed in helmet and spurs demanding to win the games he played. Humans like to win, and they want to believe what they want to believe. It is easy to use a game to provide a seemingly objective confirmation of one's own beloved theories, especially if there is a computer to add the extra aura of scientific authority.

To be of any value, a war game must somehow represent the enemy's responses, usually with either a computer program or a second player. This is very difficult to do, as it involves getting inside the opponent's head, and understanding the enemy's motivations and his perception of your motivations. A common mistake is to assume that the other side thinks as you do and will react

Illustrations by Peter Kelley.

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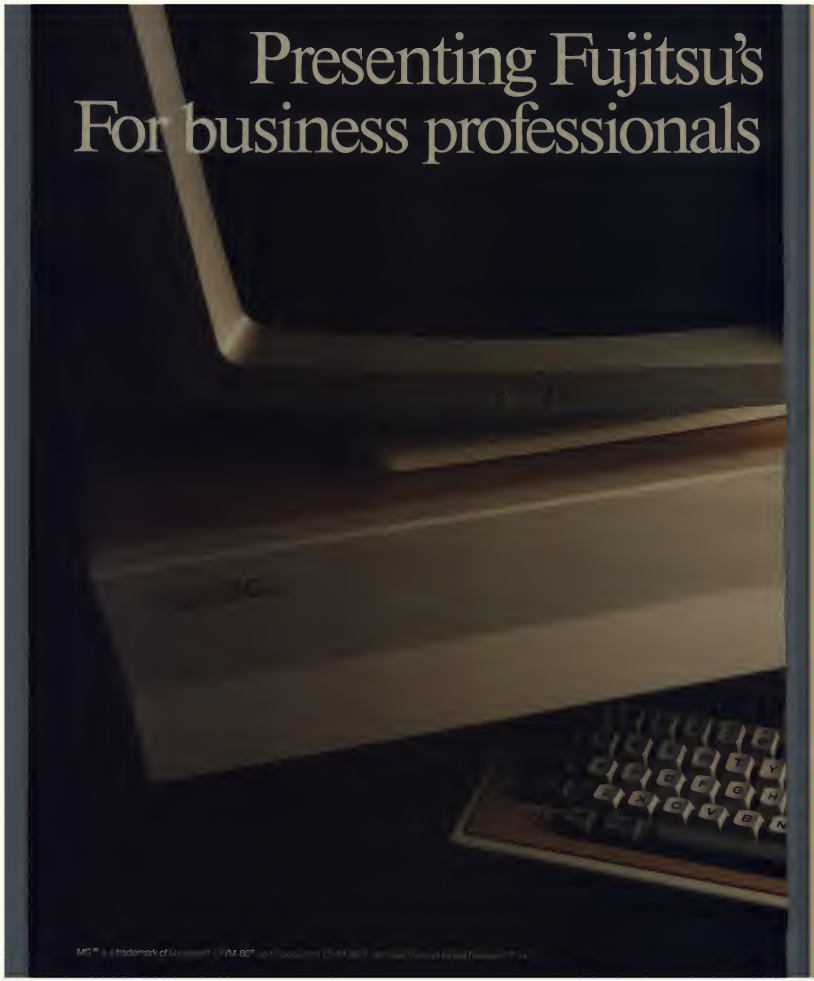
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as you would.

In World War II, the Russians and the Germans had fundamentally different views of warfare. The Germans could not understand why the Russians refused to admit they were beaten. Game theorist Anatol Rapoport states "[To the] German military, who still thought mainly in terms of gamelike characteristics of war. . .[this] was gross immorality, an affront, like the affront which a chess player feels when his clearly beaten opponent refuses to concede."

War as Game

War has long been thought of as a game. In eighteenth century Europe, war was fought by a set of rules which grew out of the code of honor of medieval chivalry. War was a gentleman's game, the sport of kings. The rules were absolutely binding, and armies in untenable positions simply surrendered.

During the American revolution, the British thought the proper way to play the game of war was to wear red uniforms and march toward the enemy in straight rows. The unsporting Americans gunned them down from behind bushes and trees. During the Maori wars, a British battalion fighting the Maori of New Zealand ran out of ammunition and was forced to surrender. The Maori reportedly responded by giving the British half of their bullets so the game could continue.

Revolutionary Americans rejected European rules of war, gunning down British Redcoats from protected positions.

While modern warfare in some ways seems less and less to resemble a game, there remain similarities. We ante up the MX and Pershing II missiles as "bargaining chips" in the arms limitation game; the opponent responds by threatening a launch-on-warning policy. We wonder if his response is a bluff—it doesn't seem rational to us to destroy western Europe on the basis of a possible computer error. But if our Pershing missiles can reach enemy command and control centers in the same six or eight minutes it may take him to determine whether an alarm is true or false, he may feel he must use his missiles or lose them. And so each new wave of the arms race game is faster, more tense, more dangerous, until the reaction times involved are being shortened to approach those required in a video game, and any of a number of wrong sequences of moves can end the game forever.

The "War Games" movie plot was farfetched in some respects but terrifyingly realistic in others. The U.S. has actually had an instance of a war game program being mistakenly loaded into a computer and then interpreted as a real attack. We have had computer errors which have caused military officers to insert ICBM launch keys into their slots in the belief that large quantities of Soviet missiles had been launched and would begin to reach their targets within minutes. ICBMs don't come back when you call them (not that you would want them to).

During a 1982 war game code-named Ivy League, U.S. commanders managed to survive for five days in their underground bunkers, demonstrating the ability to fight a prolonged nuclear war. This game marked a shift in U.S. strategy away from the policy of Mutual Assured Destruction (MAD), which guarantees a single massive retaliation, toward the policy of Nuclear Utilization Target Selection (NUTS), which seeks the ability to fight and win a drawn-out nuclear war.

The purpose of arms limitation agreements is to define the rules by which the nuclear confrontation game is played, so that both sides are playing the same game and so that they don't drain their economies only to find themselves less secure than before. There are other rules which are not arrived at by joint consensus, and which may only exist in the minds of those in power on one side or the other.

President Reagan, who is said to be fond of the world conquest boardgame, Risk, has claimed it is possible to win a nuclear war (although lately he has apparently changed his mind), and one of his advisers believes we will survive if we can manage to dig a hole and cover ourselves with three feet of dirt. The U.S. has refused to renounce the right to be the first to use nuclear weapons and has reserved the option of waging a limited nuclear war, despite the improbability that such a war could remain limited. Reagan believes ". . . you could have the exchange of tactical weapons against troops in the field without it bringing either one of the major powers to pushing the button."

The Soviet position is that any thought of limited nuclear war is absurd and that any initial attack will inevitably trigger a devasting counterstroke. While stated intentions may not coincide with either party's actual plans, it is clearly dangerous if two superpowers are playing by two different sets of rules without realizing it.

Game as Substitute for War

Now that we have seen some of the relationships between war and games, what are some positive ways in which we can transform these relationships? One almost universally popular notion is that national leaders should just go off to a field somewhere and fight it out among themselves. The "almost" is because this idea is usually not very popular with the national leaders involved. In the late Middle Ages, kings would often solemnly announce such duels to end their wars. Elaborate preparations would be made, but the battles would never happen. It was just something of a standing joke between the royal houses.

There are stories of games actually being used as replacements for war. In China during the Tsin dynasty, thousands of soldiers reportedly died in a long war between Prince Shu-an and his nephew Sha-gen. Finally, tired of the fighting and killing, they agreed to decide the winner by playing a game of Go.

H.G. Wells, who coined the phrase "atomic bomb" in 1913, once wrote a book called *Little Wars* in which he described a war game for children and expressed the idea of game as substitue for war. "Let us put this prancing monarch and that silly scaremonger, and these excitable 'patriots' . . . into one vast Temple of War . . . and let them lead their own lives there away from us." The British army soon contacted him about developing his little war into a war game for their use.

The perpetual popularity of war and

war games suggests a psychological need to act out conflict. Males in our society typically progress from toy guns and toy soldiers to football and Missile Command, and then to a brief period of real war in some place like Vietnam or Lebanon, followed by a return to the vicarious participation in war by voting, paying taxes, and monitoring the evening news. Even an otherwise reasonable individual such as myself has been known to pay $25 to the National Survival Game for the privilege of dressing up in camouflage paint and battle fatigues and chasing an enemy team through the woods for four hours, armed with a special airgun that shoots paint pellets. The U.S. Army plays a similar game at Ft. Irwin, CA, replacing the paint guns with infrared lasers which transmit coded pulses and set off strobe lights and sound effects when they hit the enemy's laser detectors.

Can games like these satisfy man's apparent psychological need for war, or do they merely fan the flames of war hysteria? Given a choice between a real war or a convincing simulation, most people would choose the simulation. Maybe world leaders should have this choice.

The goal of diplomacy is often to prevent a war by turning it into a "game" like the Cold War. Games like the space race can provide an outlet for human competitiveness, nationalism, and frontier-seeking. The Olympic Games also serve as a symbolic form of international conflict, and many countries stake a great deal of prestige on the results. We need better ways for the leaders of nations to resolve their conflicts, different games for them to play.

"Many young people have developed incredible hand, eye, and brain coordination in playing these [video] games. The Air Force believes these kids will be outstanding pilots should they fly our jets. . . Watch a 12-year-old take evasive action and score multiple hits while playing 'Space Invaders' and you will appreciate the skills of tomorrow's pilot."
—President Reagan

Game Theory

Game theory is a branch of mathematics that deals with the analysis of conflict. It shows that the study of games of strategy can be applied to the study of social events, such as war.

In game theory, a purely competitive game, such as chess or poker, is known as a zero-sum game: my gain is your loss. A game that is at least partially cooperative is called a non-zero-sum game. International relations is such a game.

A classic problem from game theory is known as the prisoner's dilemma. Two people are accused of committing a crime together. They are questioned separately. If both confess, they each get five years in prison. If both are silent, they each get one year for a lesser charge (carrying concealed weapons). If only one of them confesses, that one turns state's evidence and goes free while the other receives a ten-year sentence.

A prisoner might reason as follows: "If my partner confesses, then I am better off confessing also, since I will get only five years instead of ten. And if my partner is silent, I am again better off confessing, since I will go free instead of serving one year." And yet if both of them think this through "logically," they will be rewarded by serving five years each when they could have cooperated and gotten off with one-year sentences. Cooperation is likely only if they have some way of making an agreement and enforcing it.

The prisoner's dilemma can be applied to a variety of different conflicts, including the arms race. Two nations are preparing their military budgets. Regardless of what the opponent does, each nation appears to be more secure if it increases its own military spending instead of decreasing it. They both do so, ending up with the same relative strength and weakened economies. This is not a zero-sum game—the players have a common interest in preventing war and avoiding unnecessary spending—yet they don't trust each other enough to agree on the cooperative solution, mutual disarmament. This is the dilemma of which we are all prisoners. Just as in the original version of the prisoner's dilemma, communication is the only hope for achieving the optimal solution. It seems odd that a branch of mathematics would end up demonstrating the necessity of learning the meaning of communication and trust in order to avoid losing every game of this type.

Competition/Cooperation and Games

Having seen the tendency of people to refuse to cooperate even in games in which competition is counterproductive, we may wish to explore how such attitudes are formed and how they are affected by the games people play. Our society places great emphasis on competition, and our games and sports reflect and reinforce this emphasis. While competition itself is a good and necessary part of our existence, without the balancing element of cooperation it can lead to a winning-at-all-costs mentality and encourage aggression and violence as a way of life.

Peaceful and cooperative societies, like the Hopi, the Arapesh, and other American Indian tribes play peaceful and cooperative games. Their survival depends on sharing and cooperating, and their games are used to teach these qualities. These same tribes were conquered by a society whose games teach competition, kill-or-be-killed, win-or-lose. And while our own national survival requires a certain amount of competition, we are now in a situation where world survival depends on cooperation, where world war means kill-and-be-killed, both sides lose.

Nature uses play as a way for animals to learn useful and acceptable modes of behavior. In human society, games and sports serve this function (and others). Games are one of society's ways of programming the human nervous system. Serious research has suggested that all aspects of culture grow out of games and play. If this is true, and if we are in an age in which human survival does depend on learning to cooperate, then it may be crucial to begin incorporating the element of cooperation into our games—sports, video games, war games, and political games.

Video Games and Violence

The extreme expression of conflict is violence. Our society has expressed some concern over the violence on television

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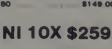

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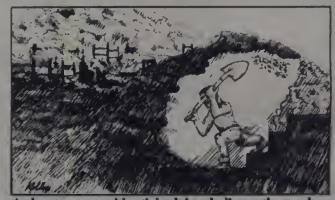
and in video games, wondering whether our TV progams and computer programs are effectively programming our society to become increasingly more violent. Being more interactive than television, video games offer the possibility of active participation in imaginary violence, and the fear is that this encourages disassociation between one's actions and the victims and consequences of those actions.

The dramatic gender gap in the arcades is apparently due in part to the reluctance of women to play video games perceived as being violent and their preference for games with disguised or cartoon-like violence, such as Centipede and Pac-Man. Not all video games involve violence, and not all are zero-sum games. Some offer a choice between violent and non-violent behavior, and others (like *Eastern Front*) reward aggression on the easier levels while making violence less and less effective as the difficulty increases. Rip-off and Joust are two excellent games which offer the option of playing cooperatively (or competitively) with another person.



At least one presidential adviser believes the nuclear game can be fought and won: "It's the dirt that does it . . . if there are enough shovels to go around, everybody's going to make it." —T.K. Jones, Deputy Under Secretary of Defense for Strategic and Theater Nuclear Forces

World Game

Buckminster Fuller, the late architect, philosopher, and Renaissance Man, created the World Game as a constructive alternative to war games. War games proceed from the Malthusian assumption that there is an inadequate supply of life support on this planet, that the "haves" can have what they have only at the expense of the "have-nots." The World Game comes to the opposite conclusion, using a database of global resources to demonstrate graphically and interactively the world distribution of population, food, energy, and technology. As the game helps to illustrate, our planet is no a zero-sum world, due largely to our vast daily energy income in the form of solar radiation.

The World Game shows that war is obsolete and that the real problem is ignorance of the options and resources available to us. Fuller claimed that computer simulation would confirm his belief that international cooperation would make us all rich, while international competition would likely make us all dead.

Such a computer simulation, programmed with a more positive set of assumptions than the war games discussed earlier, can function as a sort of peace game. Games and simulations may be used to teach interactively the importance of communication, cooperation, and other concepts from game theory, and they may be able to help us experience and understand some of the psychological factors that underlie war.

Computer models such as Carl Sagan's study of the aftermath of a nuclear war can be used to demonstrate the futility of ever playing that game. Instead of helping to plan the fighting of a war, games could help us to understand the causes and means of prevention of war. Instead of numbing us into a quiet acceptance of the possibility of world destruction, games could increase our awareness and offer new insights and new options. It's time to change the game, before it's GAME OVER. ■

A bibliography for this article is available from author c/o this magazine.

An annotated bibliography on Computer Reliability and Nuclear War is available for $1 from Computer Professionals for Social Responsibility, P.O. Box 717, Palo Alto, CA. 94301. In addition, CPSR operates a computer bulletin board for arms control. It can be accessed by dialing (415) 948-1474, using a 300 baud modem.

Ground Zero, a non-partisan educational group, offers Fire-breaks: A War/Peace Game, for $15. Contact Ground Zero, 806 15th St., N.W., Suite 421, Washington, D.C. 20005. (202) 638-7402.

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Behind The Scenes At Broderbund

A Family Affair

Ken Uston

Doug Carlston had all the right credentials. He went to Harvard College and graduated from Harvard Law School (class of '75). He began his law practice at a prestigious law firm located high in the Sears Tower in Chicago, litigating disputes over Lake Michigan water rights.

Doug became fed up with life in the Windy City and escaped, hanging out a shingle in a small town in Maine. He found that many of his clients were "night hunters" (shooting game after sunset is a dastardly crime in Maine).

Instead of just watching the grass grow, Doug filled in his leisure hours by fooling around with a TRS-80 he had bought to help run his law office. Doug took to programming. Eventually he completed a strategy game, contacted three software houses, and sold his game to all three; one was Scott Adams' Adventure International. He wisely negotiated non-exclusive agreements, retaining the right to sell the game himself.

Doug, now 32, was getting restless. His night hunters always seemed to be guilty, and the prospect of a career defending criminals, many of whom never paid their fees, appeared dismal.

He thought of joining his younger brother, Gary, who lived 3000 miles away in Eugene, OR. Gary, too, attended Harvard where he had decided to major in Celtic—for no particular reason. The program was full, but the department head for Scandinavian Studies happened to be on the same floor as the head of the Celtic program. Being of Swedish ancestry, Gary decided to major in the language and literature of his ancestors. Although he didn't know it at the time, one of Gary's intramural activities would help him make a living after graduation; he played for the Radcliffe basketball team.

Gary always had a lust for travel. Soon after graduation, he went to Sweden. Looking for pick-up games, he eventually ran into other basketball players. One thing led to another and before long Gary found himself doing something most red-blooded American boys would give their eyeteeth to do. He got a job coaching an all-girl Swedish basketball team.

"Most girls in Sweden don't look like the tall model type you'd expect," Gary explains. "This team did, though."

Somehow he managed to tend to business, and under five years of his stewardship, the team won three national championships and came in runner-up twice.

Doug Carlston stands alongside Broderbund's "trophy case of winners" which includes the Arcade Machine, a best seller he co-authored.

Then Gary decided to go to the West Coast. He taught Swedish for a while at a college in Washington State. Then he was hired as the state director for The March of Dimes in Oregon and moved to Eugene, a sleepy town about a hundred miles south of Portland. He quit in the summer of 1979 and looked for another job, in vain, for six months.

More Games

Back in Maine, Doug's success with his strategy game led him to try designing more games. He programmed a battle game, *Galactic Empire*, and a game of barter called *Galactic Trader*. Then he decided to go west. He rented a place in Eugene, and, to save rent, Gary soon moved in with him.

As the two brothers contemplated their future, Doug at one point suggested to Gary, "Let's start a software company."

Gary's reaction was something like "What's a software?" as he responded, "No way. I don't know anything about computers."

Doug was persistent. Gary had nothing else going. Finally, the brothers decided to give it a whirl.

On their first day of business, February 25, 1980, Doug went out to register the name of the company. The brothers decided on the name Broderbund, which loosely translated means brotherhood in German, Danish, and Swedish—after all, they were blood brothers. They decided to keep the Danish slashed Ø since it resembled the programmer's "9".

Gary's job on February 25 was to go out and sell software. The first day augured well for Broderbund; Gary took a $300 order.

Just a week later, Gary hastily arranged to rent a microbooth at the West Coast Computer Faire (an inexpensive option the show makes available for fledgling companies). He brought his brother's games

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and an Apple computer. The booth next door was occupied by a Japanese firm, Starcraft, who had brought Apple programs, but had no computer on which to run them. Gary let the Starcraft people run their programs on his Apple. The Japanese liked Doug's games; they also liked Gary. A friendship was soon formed.

The Japanese Connection

Things weren't looking too good back in Eugene, however. In their fourth month of operation, May, 1980, Broderbund's sales were exactly zero. Then several important events occurred.

The Starcraft group, impressed both with the brothers Carlston and the Galactic series, took a trip to Eugene. Gary, knowing full well that the Japanese put much stock in being educated at the proper schools, just happened to leave his Harvard Alumni magazine in a conspicuous place. Whatever it was that happened that day worked—the Harvard magazine, good chemistry, or the Carlston's self-effacing honesty and frankness. The Japanese, duly impressed, made a U.S. distribution deal for Starcraft products (including a game called *Apple Galaxian*) on the spot.

Gary had been thinking about making a trip to the Bay Area to sell software, but didn't have the funds. A second reason for going south surfaced when he got word that the Swedish basketball team was coming to San Francisco. Friends chipped in and bought him an airline ticket. It was a successful trip. Gary booked $5000 in orders which he called in each day. Doug, up in Eugene, filled them. Gary also made some important industry contacts.

Then the brothers decided that Doug should make a cross country auto trip to New York and back. He stopped at retail outlets across the country, calling in orders daily. When he hit New York, Doug called sister Cathy, with whom he hadn't talked for about a year.

Gary Carlston mops up the competition.

Cathy, 24, had graduated from the University of Massachusetts two years earlier, majoring in Fashion Marketing. She joined Lord and Taylor in New York City as a trainee and was eventually promoted to buyer. Doug showed Cathy some of his computer games. It was the first time she had ever seen computer software.

While Cathy posted accounting entries on the kitchen table, Gary was making phone calls in the living room, and Doug was out in the garage stuffing disks.

Doug's itinerary took him up to Connecticut. A retailer there mentioned that, just a few days earlier, he had been visited by a fellow named R. Sherwin Leff from Los Angeles, who wanted to start a software distributorship. The retailer gave Leff's business card to Doug.

Doug returned to Eugene, thinking it had been a successful trip, with $10,000 of orders taken. He didn't realize the true significance of the trip until he sent a copy of Starcraft's *Apple Galaxian* to Leff, whose company was then called Robwin. Leff was ecstatic over the game (to this day, some players feel *Apple Galaxian* is the best home rendition of the arcade game Galaxian). Leff went so far as to lend the Carlstons $800 to send 400 copies of the game to 400 retailers around the country (Robwin was later renamed Softsel and is now the largest software distributor in the country).

Broderbund sales took off, soaring from $10,000 in November to $55,000 in December. The company did $100,000 for the year.

Broderbund was still far from a pot of gold, however. Since their profit margin was between 15 and 18%, the brothers had less than $20,000 to divide between them for their around-the-clock efforts in 1980.

As the volume increased, so did the work load. The brothers hired their first employee, a part-time stuffer, in December, 1980. Business continued brisk into early 1981 when two full-time employees, and more part-timers were hired.

The Woman's Touch

Meantime, back east, Cathy was getting a bit tired of retailing and didn't particularly like the idea of living in Manhattan.

One day, while talking with her brothers on the phone, she expressed dissatisfaction with her current lifestyle. Doug said, half jokingly, "You could always move out here and work with us. As a matter of fact, we need an office manager."

Cathy had found computers a bit intriguing after seeing Doug's little software display on his visit to New York, and after a few more telephone calls, the discussions became serious. Cathy soon resigned her prestigious position in the New York fashion world and flew to Eugene, for a new career as office manager. On the day she landed, she found her new job had changed. The bookkeeper had been fired, and the brothers badly needed help in laying out and placing ads. Cathy became a bookkeeper and advertising manager.

Broderbund was still a family operation. The three Carlstons all lived together.

Cathy Carlston.

While Cathy posted accounting entries on the kitchen table, Gary was making phone calls in the living room, and Doug was out in the garage stuffing disks.

The Carlston triumvirate came to the Bay Area for the March, 1981 West Coast Computer Faire. This time the company had the funds to pay for the trip. Cathy felt a twinge of satisfaction as she realized that the Broderbund name was recognized and indeed respected at the show. They introduced their first business program, a payroll package called Broderbund Payroll.

Space Quarks

A significant event in the history of Broderbund occurred that month. The Carlstons met Chris Jochumson. Chris was something else. As a kid, he studied electronics for fun. While in the Air Force, he bought an Apple and spent his spare time experimenting with it. Chris chatted with the Carlstons. Shortly thereafter he sent

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a game he had written, called *Space Quarks*, up to Eugene.

Gary booted the disk, examined the game, and immediately picked up the phone. He called Chris and offered him $1000 plus a percentage of sales. Today, Gary sighs with relief as he recalls his impetuousness; he literally beat out other companies by minutes in recruiting Chris.

To this day, Broderbund has never lost a programmer.

Signing up Chris was a significant event for another reason. Programmers tend to prefer to work in an environment in which they can exchange ideas and learn from one another. Thus, Broderbund took its first step toward becoming a creative "think tank." (Chris is still with Broderbund. In fact, to this day, Broderbund has never lost a programmer.)

Broderbund was having problems in Eugene. The biggest hassle was the fog, which once kept the airport closed for two straight weeks. The company couldn't get its supplies; nor could they ship product. Customers, including Softsel, were screaming.

Gary wanted to move to Seattle, a city he had enjoyed in the past. But Doug and Cathy were getting weary of the Pacific northwest rain and preferred to relocate where the action was—somewhere near Silicon Valley. They prevailed, and in August, 1981, Doug and Cathy went to San Francisco to reconnoiter. They found a big house they liked, high in the hills of San Rafael.

This was no Big Corporate Move, with packers, moving vans, and first class airplane seats. The Carlstons rented a U-Haul, and friends helped them load the truck. The three of them, with Chris and Brian Eheler, who handled production, drove south caravan-style.

The Carlstons moved into the house on the hill and started interviewing people for jobs. They hired 11 employees in two months. The comings and goings attracted the attention of irate neighbors, who complained that the area was zoned for residential, not business, purposes.

So the search for an office in San Rafael began. Two months later, Broderbund moved to their current location, a Quonset hut on 4th Street in San Rafael, occupying 4000 square feet (they now have 12,000 square feet and will soon move into a more modern 17,000 square feet location in San Rafael).

David's Midnight Magic

Another significant event occurred that month. Doug and Cathy went to a computer show in Chicago. The show itself was nondescript at best. The brother and sister contingent were sitting glumly in their booth, when a young student from Brown University happened by. He introduced himself as David Snider and mentioned that he had programmed a pinball game for the Apple.

Doug evinced interest; after all, a pinball game, *Raster Blaster*, had been at the top of the Apple game charts for months. David fetched a disk of the game and returned. Doug almost fell off his chair when he saw it. There was no doubt in his mind that it was a winner.

David was considering entering the software business himself. After being exposed to the harsh financial realities of starting a business by his parents and the Carlstons, he decided to sign up with Broderbund.

David returned to Brown, completed his senior year, and, after graduation, moved out to San Rafael to become a member of the brotherhood. Broderbund took David's program, named it *David's Midnight Magic*, and released it in December, 1981. (*Midnight Magic*, as you no doubt know, went on to win critical acclaim, commercial success, and a Game of The Year award from *Electronic Games* magazine.)

1981 was a good year for Broderbund. They booked over $1 million in sales—a 1000% increase over the previous year. And 1982 started strong. In January, Dan Gorlin walked into a Los Angeles computer store. He said something about having programmed a game, and someone suggested he give Broderbund a call.

Dan had done some programming for Rand Corporation, but quit to pursue a career in music. He and his wife were in the process of selling their house in Los Angeles, and Dan thought it would be prudent to borrow his grandfather's Apple to crunch some numbers on the transaction. Between open houses, Dan passed his time experimenting with the computer. He soon discovered that the creative challenges of music applied equally to computer programming.

Choplifter

Dan had always been fascinated by helicopters. He thought it would be fun to design a game using them and was just about finished with one when he called the Carlstons. He had heard through the grapevine that they were his kind of people ("just normal folks").

The chemistry was good and Dan eventually became associated with Broderbund. Dan's game, *Choplifter*, was released in 1982. I don't have to tell you how it went on to top the game charts for months and months.

Now sales were really taking off, far beyond even the magic million dollar level of 1981. The company's prosperity didn't escape the attention of venture capitalists, who started knocking on Broderbund's door. The family was receptive, because the company needed capital to get into the cartridge business—a risky and expensive undertaking.

In September, 1982, capital was infused by Burr, Egan and Deleage, a Boston and San Francisco venture capital firm. As is always the case, Burr et al. got a piece of the action. The rest of the company stock is held by the three Carlstons and over 20 shareholders, including several of the programmers. To attract talent and provide motivation, the Carlstons established a pool for employee stock options. And, yes, the company hopes someday to go public.

The Business Market

In December, 1982, Broderbund took a big step toward changing its image as strictly a game producer. They released *Bank Street Writer* for the Apple, a surprisingly inexpensive ($70) word processing

"The Carlstons continually underestimate their own intelligence, which is one reason they've done so well."

package, which took off after prominent mention in *Time* magazine. Several months later, *Bank Street Writer* was released for Atari computers as well. It remains near the top of business software sales charts.

Broderbund did over $3 million in sales in 1982, and the prospects look even brighter for the future.

Gary, reflecting on Broderbund's growth, says, "It sounds haphazard, and it feels haphazard. But it's really not. We *did* have a business plan."

A Broderbund manager puts it another way. "The Carlstons continually underestimate their own intelligence, which is one reason they've done so well."

When considering the fierce competition in the software industry, Gary says, "Yes, you get scared. But it *is* a fact that good people rise to the top."

Gary believes that the company's formula for success is "honesty, openness, frankness, and creating a context for luck; also staying flexible . . . and you've got to really look for programmers." ■

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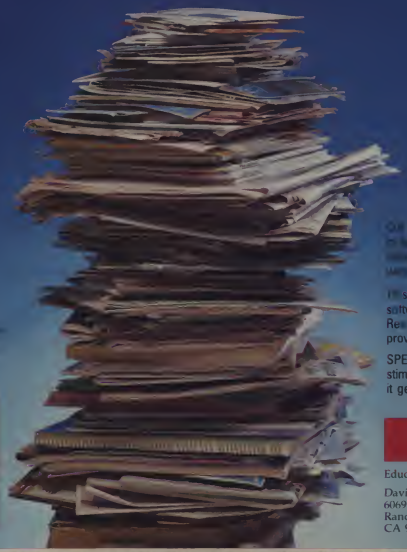

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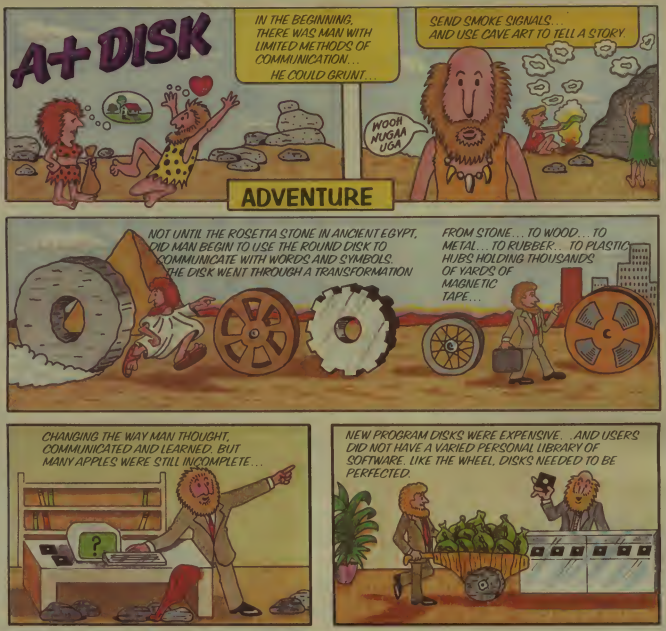
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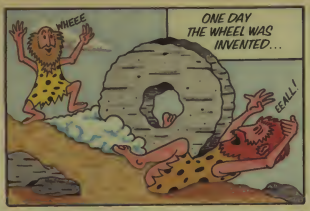

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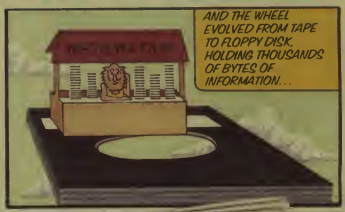

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Creative Computing Chats With Bill Budge

Arthur Leyenberger

It was an unexpected call that I received from Terrylynn Pearson. She is the public relations manager at Electronic Arts, and was calling to see if I was interested in interviewing Bill Budge, author of *Pinball Construction Set*. It seems that Bill was on the road doing some promotional appearances and would soon be in North Jersey.

Naturally I jumped at the chance, and the arrangements were made. I was especially interested in talking to a person who was being billed as a software artist who had some rather unusual ideas about software and what home computers should be. Judging from the ads Electronic Arts has been running, I was somewhat skeptical about the entire phenomenon. That is why I was not sure

I am not a rock star personality who is going to kick in my hotel room door unless they take the brown M&Ms out of my M&M bowl.

if I should expect to be meeting a rock star, a prima donna artist, or a hacker. As it turned out, I could not have accurately imagined what Bill Budge is like.

The day of my interview arrived. I was to meet Bill and his entourage at an opening of Crazy Eddie's in Totowa, NJ. I fought my way to the home computer section of the store and there found Bill Budge, a tall, lanky fellow, wearing casual clothes and a big smile. He couldn't be much over 21 years old, I thought.

As soon as Bill's obligations were fulfilled, we set out to get some lunch. New Jersey, being the "diner state," afforded us several choices, and we quickly agreed on a local diner. Bill Budge, Dave Grady (publications manager), and I arrived at the diner and found a table. Feeling much like a cub reporter for the *Daily Planet*, and more than a little nervous, I took out my tape recorder and a list of prepared questions and proceeded to have one of the most enjoyable discussions about computers and software that I can recall.

Raster Blaster

Pinball Construction Set

CC: What personal computer did you begin on?

BB: I started on an Apple II which I had bought at the very end of 1978 for half of my annual income. I made $4500 a year, and I spent half of it on the computer.

CC: You mentioned before that you prefer the Atari computer to others?

BB: Yes, but when I am starting a new game I have to program it for the Apple, because I want to get all of the markets. The Apple has the fewest bells and whistles. It has simple sound and few graphics special effects, so I just use whatever is available on the Apple. In a way, that is a weakness because markets for the other machines are getting bigger. Sound is really important now.

CC: Is it hard for you to do a translation?

BB: The way I do it, it's easy. Big pieces of the program just go over because both machines use the same chip. It takes me about two weeks. The only part that can be hard is if you have to do a lot of disk access or disk protection. I never really worry much about that, though.

Pinball Construction Set took about two weeks to translate. It is just basically going through the whole program and finding all the places you were stupid, where you scattered bit maps, and things like that. On *Pinball* I didn't. I put them all in one file, and I localized all of the I/O stuff, reading the paddles, flippers, buttons, and keyboard. It's all in one big piece.

CC: Can you talk about your next project?

BB: Yes, I think it will involve a little more programming, but the program will help you. The subject matter will be robots. I think that is a hot topic.

CC: Will it be more of a tutorial type of thing?

BB: It will be a construction set, but the key thing is that the user will be able to actually program something. The *Pinball Construction Set* required only a small amount of programming. I think the program should start helping you as the sophistication of your programming increases.

When I am starting a new game I must program it for the Apple, because I want to get all of the markets.

There will be layers, too. You will be able to program a robot to follow a track on the ground and manipulate a hand. But you can also write little AI programs that will give the robots goals. The program will include some robots, but ideally you will be able to build robots just as good.

It will be a big program. In place of the little bit map editor in the *Pinball* kit that lets you turn on the dots, this one will have a full graphics editor that might be half the size of the *Pinball Construction Set.* It's going to be big.

CC: Now that you are no longer a free agent and have signed with Electronic Arts, how much freedom do you have with your projects?

BB: Pretty much total; I can do whatever I want. They will tell me if what I am doing is stupid or a total waste of time. I may tell them that they are wrong, and we will come to an agreement. Usually we agree. We have many similar ideas. I know when something is kind of half-baked. After two weeks of working on a project, you know whether it will work or not.

CC: Electronic Arts is to be commended for promoting the artist behind the product; in fact they are almost treating people like you as rock stars or celebrities. How do you feel about that?

BB: I don't think anyone is really sure how they should be promoting. The important thing is to be promoting the people writing the programs. I am not exactly a rock star personality who is going to kick in my hotel room door unless they take the brown M&Ms out of my M&M bowl.

Dave Grady: There are two things that contribute to this idea that we are setting them up as rock stars: 1) our packaging is like record albums which was done, of course, because the disk reminds you of a record and 2) the photograph in the We See Farther ad was taken by a guy who takes photographs for rock albums.

One of the things I take very seriously, especially after today, is the extent to which software is going to be sold in the Crazy Eddie environment. A quiet personality sure isn't what you need to attract attention.

CC: Bill, do you think the type of image you have affects your products?

BB: Not really. I am always worried about getting too far away from the people who make the market. You can do things as a combination the way John Irving does. He writes a mass market book that is also literate. That is what I want to do and what I am aiming for. But I write my programs primarily for myself.

CC: Who buys Electronic Arts products? Is it adolescent males or guys like me who are over 30 and still enjoy a good game?

DG: All of those. We are asking the same question. Our assumption is that there are people who want high quality stuff that pushes the medium right to the edge. That's our customer.

Our goal is to have a product that appeals. Tripp Hawkins, the founder of Electronic Arts, talks about simple, hot, and deep as the things that you need a program to be. If you get a product that is both simple and deep like *Pinball Construction Set*, it can be used at different levels. You can simply play the five demo games that are on the disk. Or you can create an elaborate pinball game.

CC: Bill, if you could do anything with a computer without any constraints of hardware, memory or users, what would you want to do?

BB: I think I would start working on expert systems on personal computers. I think that this is the next big applications area; it is really hot right now on big systems. We need a little more memory than we have right now, but we will be there pretty soon.

My interest is home computer software. I'm not in it because it is booming; I have been writing it for a couple years. And I think the key in the home is that the programs must tell you how to use them. Actually, you don't really use them, you talk to them. That is where all of the excitement is right now.

CC: That sounds very similar to your quotation in one of the Electronic Arts ads, where you say, "Programming for a microcomputer is like writing a poem with a 600-word vocabulary." Then you mention your idea of a software friend. It seems that this, your comments about a program teaching you how to use it, and your interest in expert systems all fit together.

BB: I think what I am doing is the next step. When I first started over a year ago on *Pinball*, everyone was saying that a program larger than 16K in size is death in this market. Now they say the limit is 64K.

Everything is getting bigger. That is just the direction that things are going in. So I think my next program should push just a little bit further. The way to go now is to program in a little more sophistication in the way the program interacts with the person. The program should know if someone is at the keyboard or joystick or if it is just sitting there idle. It should know if someone is proficient in its use or a novice.

CC: To what extent do you think that the programmer's personality comes through in the program and has an effect on the person using the program?

BB: A lot. On the robot kit, I can choose very boring parts or I can choose to provide exciting and interesting types of parts. And that is a reflection of my personality and the kinds of things I am interested in.

There are different ways that a personality can come through—at the coding level or at a much higher level. As programs get bigger, they are sort of like books; there is plot, characters, and dialogue or the equivalent.

CC: Do you think of yourself as an artist turned programmer or a programmer turned artist?

BB: Programmer turning into an artist for sure. I must admit, at the very beginning the only reason I was good at it was that I was a coder. And I really liked *that*. I was learning to program. I am really good; I'm a great coder. But I am not pushing that so much anymore because there are thousands of great coders.

The program should know if someone is at the keyboard or joystick or if it is just sitting there idle.

CC: So, you are a good coder. How are you doing as an artist?

BB: I think I have been doing pretty well. Even though *Raster Blaster* was only a video game, I was learning about designing stuff. I got good at drawing. And with *Pinball*, I learned how to make the parts look good. And laying them out is like design.

Any artist always has misgivings about calling himself an artist. He thinks of himself more as a craftsman. I think a craft becomes an art form when the space of possible solutions becomes so huge that engineering can't carry you through.

Video games are engineered now, but the step I am trying to take now no one can engineer. No one really knows what I should do next, so I must figure it out.

CC: What kind of background should the people who will follow you as programmer artists of the future have?

BB: The programming is less important now, and the tools are getting better, but it always helps to be a good programmer. It is important to like computers and even more important to be able to think of things that people would want to do with their computers before they know themselves. That is a special kind of creativity. You must know in your heart before anyone else does what is going to be good and then follow through.

CC: I guess the question was a thinly disguised "what would you recommend to budding programmers" type of question.

BB: I had a kid ask me yesterday if it was too late to start programming and had all of the good software already been done. All of the good stuff is really going to be done in the future. The stuff we are doing now is crummy compared with what will finally mature.

The best thing to do is to get a computer and start programming. The tools are not yet that great, so you will probably have to learn assembler language, Pascal, or C. It should take about two years to catch up to the state of the art.

CC: Do you have any comments on computer literacy? Is it something we should be striving for?

BB: A lot of kids are simply users. They have no interest in programming. Others will sit down and figure out what programming is all about and get excited about it. But the power of the computer is starting to spread. Right now computing can be hard. Machine language is somewhat inaccessible. And Basic is not quite so bad, but is still blows some people away.

DG: I think it is unreasonable to expect computers to have a bigger impact than reading and writing. Reading and writing did not save all of mankind from stupidity. The problem I have is not with computer literacy but rather with the hype. There is far too much hype.

People are trying to struggle toward a definition of computer literacy that falls short of what literacy really is. I think that to the extent that we use the ability to read and understand Shakespeare as a measuring stick for literacy in the school environment, we use a similarly tough measuring rod for computer literacy.

I think what this stuff is, is paper. For a long time we have had paper, which is really good for expressing ideas that are

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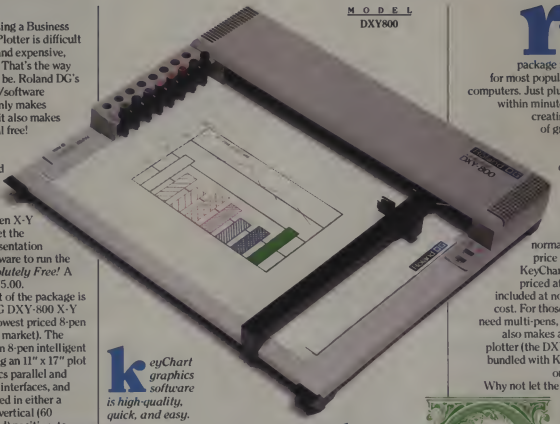

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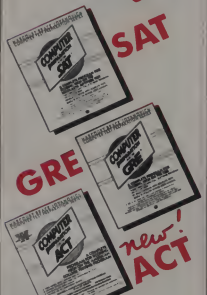

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linear or have to do with relatively static phenomena. If you want to use pencil and paper to think about dynamic phenomena, you've got to know a lot of mathematics that very few people know.

Computers let you think about dynamic phenomena. So I do not think you can overemphasize literacy in that medium. But I think you can hype it and come up with funny definitions of literacy that have something to do with naming the parts of the computer. If you take computer literacy seriously, what percentage of the population is truly computer literate? I'm not; I can't write in assembly language. And when I use that term to talk about someone else, I rarely use it just to mean capable of reading and writing at the simplest level. There must be very few people who are truly computer literate.

If you take computer literacy seriously, what percentage of the population is truly computer literate?

CC: Bill, one thing that is quite obvious is that you are an enthusiastic person who is excited about this whole crazy world of home computers.

BB: There is a lot of pressure on people who are trying to be artists. People have been let down a couple of times with their home computers, and they won't take it too many more times.

Usually there is a lot of excitement about a project, especially in the middle of it. I have to force myself to go to bed at 2:00 a.m. with something left undone until the next day. Middles are definitely the best time. The beginning is exciting in a different way, and the end is more agony than anything else—patching things and doing all the rotten stuff that you put off because you knew it would not be much fun. I have a really powerful urge to see things work.

CC: You are, to be frank, one of the superstars . . .

BB: I have been lucky. I have sort of been swept along on the crest of this wave right from the beginning. It gets bigger and bigger, and I try to stay a stroke ahead of it.

I really think that it is amazing that people actually buy software. When you think of what *could* be done and what is done. To be honest, I look at my *Pinball* program and feel that it is old stuff. I could do much better.

CC: I think you can too, and *will*. I know we will all be watching you. ■

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Structured Programming In Basic

Part 4: ANSI Basic, Macintosh Basic, and True Basic

Arthur Luehrmann

The first three articles in this series (May, June, and July, 1984) introduced the main ideas of structured programming: (1) the *top-down method* of planning a program and (2) the use of three types of *formal control blocks* to handle all problems of program logic. These powerful ideas were developed there for users of the dialects of Basic currently available on nearly all personal computers. The final two articles in the series show how these same structured programming concepts can be expressed even more simply in the new generation of Basics just beginning to appear on personal computers.

Basic: A Blessing and a Curse

It is amazing how often in popular computer magazines one reads statements claiming that Basic first appeared in the early 70's, that its design was limited by the small memories available in the first microcomputers, that it is inherently an interpreted, rather than compiled, language. None of these claims is true.

Basic celebrated its 20th birthday on May 1 of this year. John Kemeny and Thomas Kurtz, then and now professors of mathematics at Dartmouth College, aided by a small group of undergraduates, planned and implemented Basic in the early 60's, when the microcomputer was undreamed of and the minicomputer was still years in the future. Basic was designed to run on the only thing around: the mainframe computer. The problem back then was not so much limited memory as limited time. The Dartmouth team had also created the first educational time-sharing system.

Time-sharing works well only if there is time to share—that is, if each user needs only a small amount of time to run a program. Basic, therefore, had to be fast. Since compiled programs run about ten times faster than interpreted ones, Dartmouth Basic was designed from the beginning as a language that would be easy to compile.

So much for ancient history. The remarkable thing about Basic is that, despite its time-sharing mainframe roots, the language has been among the easiest to implement on general purpose minicomputers, laboratory computers, and now microcomputers. The reason for this is both the blessing and the curse of Basic.

To make Dartmouth Basic easy to compile, Kemeny, Kurtz, et al. were forced to make each Basic statement be very similar to one or two of the built-in instructions that the processor understood. The machine language of every processor contains an unconditional jump instruction; so Basic had a GOTO statement with the same effect. Every machine language has conditional jumps; so Basic had an IF statement. Every machine language has a subroutine jump and a subroutine return instruction; so Basic had GOSUB and RETURN statements. And so forth.

It is this strong similarity to machine language that has been the blessing and the curse of the Dartmouth Basic of 20 years ago. On the blessing side of the ledger, this low level nature of Basic has made it very easy for hundreds of programmers to write compilers and interpreters for the language. The curse is more subtle; at first it looks like another blessing. Since each Basic statement is extraordinarily simple and easy to understand without reference to any surrounding statements, one might think that programs made up of these simple statements should also be easy to understand. Sad experience has shown that this is not the case.

Just as one can understand all the words in a paragraph and still not understand its meaning, so it is with computer programs.

Just as one can understand all the parts in a wind-up clock and still not understand how the clock works, or all the words

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in a paragraph and still not understand the meaning of the paragraph, so it is with computer programs. One needs to understand the parts, but one also needs to see how the parts work together to make up the whole. One needs to see how the parts are organized. One needs to see large scale structures without being bogged down by a mass of detail.

These discoveries about programs began to appear in the mid-60's, mainly as a result of growing experience with another low level language, Fortran. As computer memories got bigger, so did the Fortran programs being stuffed into them by a growing army of professional programmers. And as the programs got longer, they took disproportionately more time to write and debug. Far worse than that, long programs were vastly more expensive to maintain than shorter ones.

Out of this experience came a great deal of deep thinking about the things that make a program complex. In the late 60's, the ideas we now know as *structured programming* began to appear in journal articles. Soon after that, new programming languages such as Pascal incorporated these structuring ideas in the form of specific tools for handling complexity and taming it.

The Evolution of Basic

To look at Basic as implemented on nearly every personal computer today, one could easily conclude that the structured programming wave had simply washed over Basic and left it far out at sea. As a practical matter, that is indeed the case. The Basic that comes built into all the millions of Apple, IBM, and Radio Shack computers is, apart from numerous special features, little different from the Dartmouth Basic of 20 years ago. In fact, most of the programs I wrote at Dartmouth in the 60's would run unmodified on these current Basics. Like the Dartmouth original, these Basics force programmers to solve their problems by means of unstructured jumps of control: the GOTO, IF, GOSUB, and RETURN statements.

Nevertheless, it is wrong to say that the Basic language has been left behind by structured programming ideas. Nearly 15 years ago, Dartmouth Basic added a CALL statement and other statements allowing a Basic programmer to create subprograms (procedures) with names, two-way parameter passing, and local variables. Shortly after that, it became possible to create a separate file of subprograms, compile them, and establish a link between the file and a user's program. About eight years ago, a new version of Dartmouth Basic offered a complete set of formal control blocks for loops and branches, thus eliminating the need for the unstructured GOTO and IF statements and for line numbers.

Unfortunately, most of this creative work at Dartmouth has somehow been kept a deep, dark secret from the rest of the world. None of these structured programming tools has found its way into the Basics to which most people have access today. In the early 70's when Bill Gates wrote the first Basic interpreter for a microprocessor, his model, alas, was the 1964 version of Dartmouth Basic. Neither he nor his company nor his successors have seen fit to update that model. As a result, hundreds of thousands of personal computer programmers have been forced to learn and use a language that by all rights should be considered an interesting fossil.

ANSI Basic

The sorry state of personal computer Basics is about to change. For nearly a decade, Committee X3J2 of the American National Standards Institute (ANSI) has been at work on developing standards for the Basic language. X3J2 is made up of about 30 volunteers who come from universities, schools, and mainly the computer industry. The Committee does not set any standard; rather it proposes a standard and distributes it for public comment. A parent committee, X3, makes the final decision.

X3J2's first few years were spent (in hindsight, some might say "wasted") on standardizing what amounts to the original 1964 Dartmouth Basic. This was necessary, however, since so many implementors kept getting simple things wrong. For example, the FOR loop is incorrectly handled in nearly all microcomputer Basics prior to the IBM PC version. Consider the following program:

```
10 PRINT "HOW MANY STARS DO YOU WANT";
20 INPUT N
30 FOR J = 1 TO N
40    PRINT "*";
50 NEXT J
```

When Kemeny and Kurtz designed Basic, they thought hard about programs like this. A user, they believed, would expect to see N stars, for any value of N *including 0*. Therefore, if N is zero, the body of the loop should not be performed at all. In other words, the loop exit test should be made at the beginning of the loop, not the end. That is how the FOR loop has worked in Dartmouth Basic for 20 years. Not so with Gates's first interpreter and most of the Basics that have descended from it.

After many years of quarterly week-long meetings, a draft proposal for ANSI Basic has been agreed to and sent to the public for comment.

So the first several years of Committee X3J2's life were spent defining a standard called ANSI Minimal Basic, which tidies up such matters as the FOR loop. (A copy of the Minimal Basic standard, X3.60-1978, is available from ANSI, 1430 Broadway, NY, NY 10018.)

The members of X3J2 recognized that Minimal Basic was more a toy than an actual language. To make it useful, implementors would be forced to enhance, almost certainly in a nonstandard way. Therefore, the Committee turned its attention next to the definition of another language to be called ANSI Basic. It would, for reasons of compatibility, be a superset of Minimal Basic; but it would also contain programming elements thought to be essential for writing serious applications.

After many years of quarterly week-long meetings, a draft proposal for ANSI Basic has been agreed to and sent to the public for comment. If things go about as expected, a formal standard should take effect in about a year. The draft standard is strongly influenced by the structured version of Basic that has been developed at Dartmouth over the past decade and user-tested by tens of thousands of people. It contains all the elements needed for modular, top-down design and for specifying control structures.

Already, the draft standard is having an effect that personal computer users can see. Several member organizations of X3J2 have created new microcomputer versions of Basic that are strongly influenced by the draft standard. At the time of this writing, Apple Computer is in the final throes of implementing Macintosh Basic, which is modeled closely upon the ANSI draft.

Another company, True Basic, Inc., founded by Kemeny, Kurtz, and a small team of Dartmouth programmers, is also at work on a product called True Basic, which will run on both the IBM PC and the Apple Macintosh. True Basic, which will be distributed by Addison Wesley Publishing Company, conforms extremely closely to the ANSI draft. By the time this article appears, Macintosh Basic and True Basic should be

available for purchase. Other implementations of ANSI and ANSI-like Basics are probably under development by others.

Top-Down, Modular Design

The rest of this article and the one next month present the elements of ANSI Basic that make it easy to use when following the guidelines of structured programming. The best way to understand these new elements is through an example. The third article in this series (July, 1984) showed how to apply the methods of structured programming to write a game-playing program.

The computer was to get a secret word from a third party and then to ask the main player to guess the word. If the guess was wrong, the computer was to prompt the player as to whether the secret word was earlier or later in the dictionary than the guess, and then to ask for another guess. The program below was the result. (Later in the July article the problem was improved a bit, but this version will serve our present purposes.)

```
100 'PROGRAM GUESSING GAME
110    GOSUB 200   'SECRET WORD
120    GOSUB 400   'GUESS WORDS
130    GOSUB 600   'WRAP UP
140  END
190 '
200 'SUB SECRET WORD
210    CLS
220    PRINT "WHAT'S THE SECRET WORD";
230    INPUT S$
380  RETURN
390 '
400 'SUB GUESS WORDS
410    'LOOP
420        PRINT "WHAT'S YOUR GUESS";
430        INPUT G$
440      IF G$ = S$ THEN 500
450        GOSUB 800 'HINT
490        GOTO 410
500    'END LOOP
580  RETURN
590 '
600 'SUB WRAP UP
610    PRINT "YOU GOT IT!!!"
620    PRINT "THE WORD WAS"; S$.
780  RETURN
790 '
800 'SUB HINT
810    IF S$ < G$ THEN 850
820      'FALSE
830        PRINT "LATER THAN"; G$
840        GOTO 870
850      'TRUE
860        PRINT "EARLIER THAN"; G$
870    'END IF
980  RETURN
```

With minor exceptions (for example, the abbreviation of REM by an apostrophe), this program conforms to the ANSI Minimal Basic Standard. You can enter it and run it on almost any computer. Although using Minimal Basic, the program is written in a highly structured form, as described in detail in the earlier articles.

First, it adheres to the principle of top-down design: There is a main routine and a set of subroutines. Second, all problems of control are handled by formal loop and branch blocks. A loop block appears in lines 400-500, and a branch block appears in lines 810-870. Both blocks are built up from Minimal Basic REM, GOTO, and IF statements.

Without further discussion, let's see how this program might be written in ANSI Basic.

```
Program GuessingGame
   Call SecretWord(s$)
   Call GuessWords(s$)
   Call WrapUp(s$)
End

External sub SecretWord(secret$)
   Clear
   Print "What's the secret word";
   Input secret$
End sub

External sub GuessWords(secret$)
   Do
     Print "What's your guess";
     Input guess$
   If guess$ = secret$ then exit do
     Call Hint(secret$, guess$)
   Loop
End sub

External sub WrapUp(secret$)
   Print "You got it!!!"
   Print "The word was";secret$
End sub

External sub Hint(secret$,guess$)
   If secret$ < guess$ then
     Print "Earlier than ";guess$
   Else
     Print "Later than"; guess$
   End if
End sub
```

The first thing to notice is that the overall form of these two programs is essentially the same. This is true because both versions follow the guidelines of structured programming. In both, we find a main part and four subparts. Furthermore, the bodies of all the parts consist only of action blocks, loop blocks, and branch blocks. There are a few new Basic keywords in the second version, but the general shape and structure is the same as in the first version.

Some differences are also striking. The first version has line numbers, while the second has none. Actually, the ANSI standard requires line numbers, but only for compatibility with Minimal Basic. The new control structures in ANSI Basic eliminate the need for line numbers. Every implementation of ANSI Basic is expected to make line numbers optional to the programmer. This is true of Macintosh Basic and True Basic.

Another obvious difference is the use of lowercase letters and long variable names in the second version. Uppercase and lowercase letters are treated as equivalent when used anywhere in ANSI Basic except as string constants. It is up to the programmer to develop a consistent style of capitalization. Long variable names allow the programmer to use meaningful names for the data to be processed. There is a slight penalty for allowing long names: They must be delimited from Basic keywords by a space. In older Basics, the two statements

```
Let a = 5
Leta = 5
```

have exactly the same effect. In ANSI Basic, the first statement would assign 5 to the variable a, while the second statement would assign 5 to the variable Leta and assume that the Let keyword had been left out.

From the point of view of top-down design and program modularity, the important features to note in the ANSI Basic version are the five parts separated from one another by blank lines. (The final article in this series will deal with the content of the parts. For now, the focus is on the relation among the

parts.) These five parts are examples of *program units*. The first part is the *main unit*. It begins with the Program statement and ends with the End statement. Every ANSI Basic program must have such a unit. The four parts that follow it are examples of *external units*. Each one begins with an External-sub statement containing the name of the unit and each ends with an End-sub statement.

In ANSI Basic, each program unit is a separate world. Variable names introduced in one program unit have local significance only and are unknown to other program units. If by chance the same name is used for two different variables in different program units, no problems will arise. Likewise, each program unit has its own separate sequence of Data statements; a Read statement in one unit will refer to Data values in that unit alone.

This situation is very different from the one in Minimal Basic. There, all variable names are known globally, throughout the entire program. Likewise, all the Data statements in a program define a single sequence of items that may be read by any Read statement in the program. In effect, an entire Minimal Basic program is like the main unit in an ANSI Basic program.

Parameter Passing

If all variables are local, how then do the various program units communicate with one another in an ANSI Basic program? The answer is that they must pass data back and forth in the form of *parameters*. In the example, the main unit contains the statement

```
Call SecretWord(s$)
```

and the corresponding external unit looks like this:

```
External sub SecretWord(secret$)
    Clear
    Print "What's the secret word";
    Input secret$
End sub
```

The Call statement in ANSI Basic serves the same function as the GOSUB statement in Minimal Basic. Both statements transfer control to another part of the program; when that part is finished, control normally returns to the statement after the Call or GOSUB. In addition, the above Call statement identifies the variable s$ as a parameter, through which data may be sent to a program unit or, as in the present case, received from it.

The job of SecretWord is to get someone to enter a secret word into the computer. The Input statement accepts the word and assigns it to secret$. Notice that the name secret$ also appears in parentheses right after the name of this program unit. This indicates that secret$ is the name of a parameter through which data (in this case, the secret word) may be passed back to the caller. Several such parameters may be specified this way, with the comma used as a separator.

Notice that the calling unit does not have to know what name the called unit used for the data to be sent back. The caller invents its own name—s$ in the present case. Once the Call statement is performed, the value of s$ in the main unit is identical to the value secret$ had in the external unit. They are simply two names for the same thing.

The second Call statement in the main unit looks like this:

```
Call GuessWords(s$)
```

This statement tells the computer to perform the statements in the body of GuessWords. But this time, the value of s$ is being sent into the external unit, not retrieved from it. Parameter passing is a two-way street in ANSI Basic. Such parameters are known as *reference* parameters. (Pascal programmers know them as VAR parameters.)

The remaining external units in the ANSI Basic example work much the same way as GuessWords. In each case, one or two parameters are passed into the unit by means of a Call statement. The names of the parameters in all four external units happen to be the same: secret$ and guess$. As stated above, this is not necessary. Each program unit can have its own "private name" for the parameters to be sent back and forth. This is especially important when programs are developed by a team of writers. The members of the team must agree only on what the program units must do and what parameters must be passed, but not on parameter names nor on the names of local variables.

Three Kinds of Procedure

As stated earlier, an ANSI Basic program is a collection of fairly independent program units. There must be a main unit. In addition, there may be several external units. Units communicate with one another by passing parameters back and forth. Within a unit, all variable names are local to that unit.

Units communicate with one another by passing parameters back and forth. Within a unit, all variable names are local to that unit.

So far, we have seen only one kind of external unit. Recall the keyword sub in the first line of each of the four external units in the program example. This word indicates that the unit is a Basic *subprogram*. A subprogram is one of three different kinds of *procedures* available in ANSI Basic. The other two are *functions* and *pictures*. Like subprograms, functions and pictures have names and may use parameters to communicate. Here is an example of a simple external function unit:

```
External function RandomInt(first, last)
    Let n = last - first + 1
    Let RandomInt = first + int(n * rnd)
End function
```

There are two differences between the appearance of functions and that of subprograms. First, the keyword function replaces the keyword sub in the first and last lines. Second, somewhere in the body of a function, the name of the function must appear on the left side of a Let statement; this is how the function returns a value to the program unit that calls it. In fact, the parameters in functions are unavailable for two-way communication. Function parameters may only send data into the function, not return data to the caller. Such one-way parameters are called *value* parameters.

The value returned by the above function is a random integer in the range between the values of first and last, inclusive. As with Basic built-in functions, such as int and rnd, a user-defined function is called simply by using its name in an expression. After the function unit is performed, the single value it returns replaces the name of the function in the expression from which the function was called.

The third kind of procedure in ANSI Basic is the picture, which is used to define some graphic object, such as a circle. Graphics is beyond the scope of this series of articles. Suffice it to say that a picture is just like a subprogram except for the way it is called. The caller uses a Draw statement instead of a Call statement. Furthermore, the Draw statement allows the caller to specify a location, size, and orientation angle for the picture. Thus a picture which is defined as a circle can be called as an ellipse, rotated 45 degrees, and placed at a new origin—all with a single Draw statement.

Incidentally, all three ANSI Basic procedures may be called recursively. That is, a statement in the body of a given procedure may call that procedure itself. This is often a useful way to conceptualize certain otherwise complex programming problems.

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Internal Procedures

External procedures—subprograms, functions, and pictures—give the programmer powerful tools for dividing a large programming task into a number of distinctly separate pieces that communicate with one another by passing specific pieces of data back and forth. Since these units are largely independent of one another, they can be developed and tested without fear of accidental interactions.

It often happens that a given program unit becomes larger and larger during the process of development. At some point, the unit may become so large that it is hard to read, understand, or change. The solution is to divide it into smaller units. However, one is then faced with a different kind of confusion: too many external units to keep track of. A better approach is to divide a lengthy program unit into a small number of subunits, all within the same unit. In ANSI Basic, this is done by means of *internal procedures*.

As an example, here is how program GuessingGame would look if it were written as a single main unit containing its own internal procedures.

```
Program GuessingGame
  Call SecretWord
  Call GuessWords
  Call WrapUp

  Sub SecretWord
    Clear
    Print "What's the secret word";
    Input Secret$
  End sub

  Sub GuessWords
    Do
      Print "What's your guess";
      Input guess$
    If guess$ = secret$ then exit do
      Call Hint
    Loop
  End sub

  Sub WrapUp
    Print "You got it!!!"
    Print "The word was";secret$
  End sub

  Sub Hint
    If secret$ < guess$ then
        Print "Earlier than";guess$
    Else
        Print "Later than";guess$
    End if
  End sub
End
```

Note first that the text of the procedures now appears before the End statement, which is now the last statement. That is, the procedures are now inside the main unit, whereas before they were outside. Note also that the keyword External no longer appears in the first line of each procedure. Finally, note that parameter passing is no longer needed here.

The main difference between internal and external procedures has to do with the scope of variable names. Internal procedures in a given program unit all share the same set of variable names. In the example here, secret$ first appears in procedure GetWord. Later references to secret$ in the other procedures all refer to the same data value. That is why parameter passing was unnecessary in this case. (It is legal to pass parameters to internal procedures however, and often very useful.)

The scope rule in ANSI Basic is very simple: a given variable name is known (1) everywhere within a program unit, and (2) nowhere outside that unit unless the variable is passed as a parameter to another unit. To put it another way, variable names are global within a program unit and local to that unit. The same is true of items in Data statements. It is also true of file channels, though that subject is beyond the scope of these articles.

The preceding program example showed only one particular kind of internal procedure: the internal subprogram. There can also be internal functions and internal pictures. The same scope rules apply to them.

Coming Next Month

This article has introduced the elements of ANSI Basic that are useful for dividing a complex problem into simpler, relatively independent parts. External procedures, which have local variables and communicate via parameters, are the main modules out of which a long program is built. Internal procedures, which share variables with one another and with the program unit in which they are contained, provide subunits within the main modules.

Now we leave the topic of top-down design and program modularity. In the final article in this series we shall turn to the other main component of structured programming: the use of formal control structures to handle all problems of program logic. The June and July articles in this series showed how to build these loop and branch structures out of REM, IF, and GOTO statements. In ANSI Basic, these structures come ready-made. It is this fact which allows the programmer to avoid all those wild jumps that can easily turn a simple program into a tangle of spaghetti code. ■

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Hot Air Balloon

Dan Westesen

Have you ever watched a beautiful balloon soaring over town on a cool Saturday morning in the fall and wished you could go for a ride? Well, it's not quite the next best thing but this program will allow you to soar with your Apple. You can float over craggy mountains, and if you aren't careful, you can crash on those mountains. But, it is easy to repair the balloon and fly once again: Just type yes and press RETURN and it is up, up, and away.

The balloon has several of the features of a real balloon, including slow reaction times. If you want to rise, it may take several seconds after you turn on the burner for the balloon to react. Similarly, it may take several seconds after the burner is turned off for the balloon to level off or begin descent.

The balloon also has only a limited amount of fuel. If you are in the wrong place when you run out, the result is a crash landing. Even if you do manage to land on a nice flat spot, you will crash if you descend too fast (-12 vertical velocity). The balloon also comes equipped with a fuel gauge, vertical speed indicator, altimeter, and burner monitor.

As in the real world, winds in this program blow in different directions at different velocities. There is an upper level wind, a lower level wind, and a tricky wind between the peaks. The last and most challenging similarity to reality is that everything in this program happens very slowly until you are in trouble; then it happens all too fast.

Entering the Program

The program is in two parts. The main part of the program is very simple to enter. Enter it as you would any basic program. The second part of the program is the shape table for the balloon and the crashed balloon (the mountains are drawn from the main program). To enter the shape table, first enter the monitor (CALL-151) and enter the shape table as shown, replacing the dashes with colons. When finished type BSAVE SHAPE:BALLOONS, A$4000,L$9D. The program has a provision for loading the shape table the first time (lines 310 through 340).

Explanations, Variables and Modifications

The remarks outline what the program does in each section. Here are some further explanations to help in modifying the program.

Lines 110 through 130 set up the rotation for aerial crashes. These crashes occur when the balloon hits the top or side boundaries.

Lines 470 through 990 take care of the launch, winds, flight, and checking for crashes. Lines 1000 through 3160 do the crashes, landings, scoring, and restarting the program.

If you want more or less fuel just change the variable FUEL in line 160. Also in line 160 you will find the variables X1 and Y1, the starting coordinates of the balloon.

LFT is the variable for the current rate of change of altitude of the balloon. How much this variable is incremented can be adjusted in lines 590 and 610 and 640.

The variable for wind is WND, and it is set in 690 through 710. These lines check the position of the balloon and then set the direction and speed of the wind.

Lines 765 through 790 update the instrument panel.

Lines 810 to 850 check to see if the balloon is on one of the flat landing zones. If it is, the program goes to line 1000 to check if the landing was too hard before continuing.

Mountain crashes are checked in lines 890 through 940. These lines contain the equations of the lines running along the mountain sides. If the point on the bottom of the balloon crosses one of these lines, a crash occurs.

Line 980 checks to see if the edge of the screen has been touched by the balloon. If it has, the program skips to line 3000 where a spinning crash occurs.

Lines 1040 through 1120 finish good landings and do the score keeping. The first good landing is worth 5 points, the second 10 points, the third 15 points, etc.

Lines 2000 through 2070 crash the balloon if it hits the side of the mountain.

Try the program as it is first, then try modifying the fuel, winds, and lift. Happy ballooning! ■

Listing 1.

```
10  REM  ************************
20  REM  *  HOT AIR BALLOON   *
30  REM  ************************
40  REM
50  REM       BY DAN WESTEEEN
60  REM       JANUARY 21,1984
70  REM
80  REM
90  DIM B(8)
100 FOR I = 1 TO 8
110 READ B(I): REM BETB ROT FOR
     AERIAL CRASH.
120 NEXT I
130 DATA  0,10,15,25,35,40,45,55
140 HOME
150 INPUT "DO YOU WANT INSTRUCTI
    ONS? ";A$
160 IF LEFT$ (A$,1) <  > "Y" THEN
     GOTO 310
170 PRINT "                HOT AIR B
    ALLOON"
180 PRINT
190 PRINT
    PRINT "THE OBJECT OF THIS GA
    ME IS TO LAND ON   THE THREE
     FLAT AREAS WITHOUT CRASHING
    ."
200 PRINT
210 PRINT "YOU CONTROL THE HOT A
    IR BALLOON'S BURNERWITH THE
    KEYS 'B' AND 'N'.THE LETTER
    'B'TURNS THE BURNER ON AND T
    HE LETTER 'N'  TURNS IT OFF.
    "
220 PRINT
230 PRINT "THERE ARE THREE LEVEL
    S OF WIND. THE HIGHLEVEL BLO
    WS FROM RIGHT TO LEFT.  THE
    LOWLEVEL BLOWS FROM LEFT TO
    RIGHT.  THERE  IS ALSO A WIN
    D BETWEEN THE MOUNTAINS     T
    HAT BLOWS FROM RIGHT TO LEFT
    .   BE CARE-FUL!!!"
240 PRINT
250 PRINT "YOU WILL CRASH IF YOU
     HIT A MOUNTAIN OR THE EDGE
    OF THE SCREEN."
260 PRINT
270 PRINT "IF YOU LAND AT A VERT
    ICAL VELOCITY OF   LESS THAN
     -12 YOU WILL ALSO CRASH."
280 PRINT
290 PRINT "HIT ANY KEY TO CONTIN
    UE";: GET A$
300 HOME
310 INPUT "LOAD THE SHAPE TABLE?
     ";A$
320 IF  LEFT$ (A$,1) = "N" THEN
     GOTO 350
330 PRINT  CHR$ (4) + "BLOAD SHA
    PE:BALLOONS"
340 POKE 232,0: POKE 233,64
350 REM
360 REM $$$$DRAW MOUNTAIN$$$$
370 REM
380 HGR
390 HOME : ROT= 0: SCALE= 1:TTL =
    0:PTS = 0:LFT = 0: HCOLOR= 7

400 HPLOT 0,159 TO 0,0 TO 279,0 TO
    279,159 TO 0,159
410 HPLOT 0,159 TO 10,150 TO 28,
    150
420 HPLOT  TO 64,129 TO 80,129 TO
    110,108
430 HPLOT  TO 160,151 TO 177,151
     TO 226,84
440 HPLOT  TO 229,89 TO 232,80 TO
    235,84
450 HPLOT  TO 238,84 TO 261,131 TO
    279,131
460 REM
470 REM  $$$LAUNCH AND FLIGHT$$$
480 REM
490 FUEL = 160:X1 = 19:Y1 = 135:L
    FT = 0
500 XDRAW 1 AT X1,Y1
510 HOME : VTAB 23
520 PRINT"TURN ON BURNER TO LIF
    T OFF"; GET A$
530 IF A$ <  > "B" THEN  GOTO 51
    0
540 X1 = 19:Y1 = 135
550 HOME : VTAB 22: PRINT "FUEL
    REMAINING= ";FUEL
560 PRINT "VERT. VELOCITY= ";"0"

570 VTAB 22: HTAB 24: PRINT "ALT
    ITUDE= "; INT ((159 - Y1) *
    100)
580 PK =  PEEK ( - 16384): POKE  -
    16368,0
590 IF FUEL = 0 THEN LFT = LFT -
    .05# GOTO 660
600 IF FUEL = 0 THEN  GOTO 690
610 IF PK = 66 THEN LFT = LFT +
    .1:FUEL = FUEL - 1
620 IF PK = 66 THEN  VTAD 23: HTAB
     24: PRINT "BURNER ";: INVERSE
    : PRINT "ON ": NORMAL
630 IF FUEL <  = 0 THEN FUEL = 0

640 IF PK = 78 THEN LFT = LFT -
    .05
650 IF PK = 78 OR FUEL <  = 0 THEN
     VTAB 23: HTAB 24: PRINT "BU
    RNER OFF"
660 REM
670 REM $$$$SET WIND$$$$$
680 REM
690 IF Y1 < 50 THEN WND =  - .9
700 IF Y1 >  = 50 AND  NOT (Y1 >
    100 AND X1 > 110 AND X1 < 21
    0) THEN WND = .75
710 IF Y1 > 100 AND X1 > 110 AND
    X1 < 210 THEN WND =  - .75
720 X2 = X1:Y2 = Y1
730 X1 = X1 + WND
740 Y1 = Y1 - LFT
750 XDRAW 1 AT X1,Y1
760 XDRAW 1 AT X2,Y2
765 IF FUEL = 0 THEN  VTAB 22:
     HTAB 16: FLASH : PRINT "NO
    FUEL": NORMAL : GOTO 780
770 VTAB 22: HTAB 16: PRINT FUEL
    ;" "
780 VTAB 22: HTAB 34: PRINT  INT
    ((159 - Y1) * 100);"  "
790 VTAB 23: HTAB 16: PRINT  INT
    (LFT * 10);"  "
800 REM
810 REM $$$$SAFE LANDING??$$$$
820 REM
830 IF Y1 > 114 AND (X1 > 65 AND
    X1 < 77) THEN  GOTO 1000
840 IF Y1 > 136 AND (X1 =  > 160
    AND X1 < = 179) THEN  GOTO
    1000
850 IF Y1 > 117 AND (X1 > 263 AND
    X1 < 279) THEN  GOTO 1000
860 REM
870 REM $$$$HIT MOUNTAIN??$$$$
880 REM
890 IF (X1 > 30 AND X1 < 61) AND
    Y1 >  - .57 * X1 + 151 THEN
    RT = 55: GOTO 2000
900 IF (X1 > 80 AND X1 <  = 113)
     AND Y1 >  - .56 * X1 + 158
     THEN RT = 55: GOTO 2000
910 IF (X1 > 115 AND X1 < 160) AND
     Y1 >  - .79 * X1 + 8 THEN RT = 6
    : GOTO 2000
920 IF (X1 > 175 AND X1 < 223) AND
     Y1 >  - 1.38 * X1 + 378 THEN
    RT = 55: GOTO 2000
930 IF (X1 > 238 AND X1 < 261) AND
     Y1 > 1.79 * X1 - 351 THEN RT
    = 6: GOTO 2000
940 IF (X1 > 225 AND X1 < 238) AND
     Y1 > 68 THEN RT = 0: GOTO 20
    00
950 REM
960 REM $$$$EDGE OF SCREEN??$$$$
970 REM
980 IF X1 < 12 OR X1 > 273 OR Y1
     < 12 THEN 3000
990 GOTO 580
1000 REM
1010 REM $$FINISH GOOD LANDING$$
1020 REM
1030 IF LFT <  - 1.2 THEN  GOTO
     2000
1040 PTS = PTS + 5:TTL = TTL + PT
    S
1050 IF X1 > 263 THEN  HOME : VTAB
     23: PRINT "GREAT FLIGHT!
     TOTAL POINTS=";TTL: GOTO 2
    070
1060 PRINT : PRINT "CONGRATULATI
    ONS!   POINTS=";PTS;"   TOT
    AL=";TTL
1070 PRINT "TURN ON BURNER TO CO
    NTINUE"
1080 GET A$: IF A$ <  > "B" THEN
     GOTO 1060
1090 LFT = 0: XDRAW 1 AT X1,Y1
1100 Y1 = Y1 - 3
1110 XDRAW 1 AT X1,Y1
1120 GOTO 550
2000 REM
2010 REM $FINISH MOUNTAIN CRASH$
2020 REM
2030 HOME : VTAB 23: PRINT "YOU
     CRASHED!!    TOTAL POINTS="
    TTL
2040 XDRAW 1 AT X1,Y1
2050 ROT= RT
2060 DRAW 2 AT X2,Y2 + 15
2070 GOTO 3140
3000 REM
3010 REM $FINISH AERIAL CRASH$
3020 REM
3030 HOME : VTAB 23: PRINT "YOU
     CRASHED!"
3040 FOR T = 1 TO 8
3050 X2 = X1:Y2 = Y1
3060 Y1 = Y1 + 5
3070 XDRAW 1 AT X2,Y2
3080 ROT= B(T)
3090 XDRAW 1 AT X1,Y1
3100 NEXT
3110 IF Y1 < 125 THEN  GOTO 3040
3120 XDRAW 1 AT X1,Y1
3130 ROT= 0: XDRAW 2 AT X1,155
3140 INPUT "DO YOU WANT TO PLAY
     AGAIN? ";A$
3150 IF  LEFT$ (A$,1) = "Y" THEN
     GOTO 390
3160 TEXT : HOME : END
```

Shape Table.

```
$4000.409F

4000- 02 00 0A 00 71 00 3F 3C
4008- 27 27 27 27 3C 36 2E 34
4010- 2E 36 2E 34 2E 36 2E 34
4018- 36 2E 24 24 2C 36 36 2E
4020- 24 24 2C 34 34 2E 24 24
4028- 2C 24 34 2E 24 24 2C 24
4030- 2C 24 2C 24 2C 24 2C 24
4038- 3C 36 37 37 37 3E 3E 3F
4040- 24 24 27 24 27 24 25 24
4048- 25 25 2C 36 35 35 36 35
4050- 36 37 36 37 37 0E C0 09
4058- 08 48 C0 09 48 22 24 27
4060- 3C 3C 3C 3C 27 3F 3F 37
4068- 3F 3E 3E 3E 36 37 36 00
4070- FF 3F 3F 3F 3F 3F 3F 3F
4078- 27 25 2D 2C 2D 25 2D 2E
4080- 35 35 2D 3E 3F 3C 3C 3F
4088- 37 37 2D 2C 35 4D 09 2D
4090- 2E 2D 2D 24 2D 2D 35 3E
4098- 3F 3F 00 3F 37 40 15 FF
```

Computing For The Handicapped

Shel Talmy

This month, I want to catch up on numerous items about computing for the handicapped. The field is as active as mainstream computing, and a multitude of products has entered the market at about the same time. This is especially gratifying to the handicapped user, who, as recently as a few months ago had virtually nothing with which to enhance his quality of life, or increase his potential for earning a livelihood.

The computers, peripherals, and software that are now available are making these dreams a reality. A door has been opened to the marketplace, and although the opening is small, the hinges are oiled and the portal is poised to be flung wide.

The products currently at hand cover the entire spectrum of uses for the handicapped, from giving a voice to the severely disabled to providing a means for the visually impaired to achieve the independence they seek via computer. And products on the horizon look even more promising.

Talking foot. Born with cerebral palsy, Jim Brooks had to wait until he was 23 years old before he could speak. Now 26, Jim works as a student researcher in the Artificial Language Laboratory, programming computers to allow other individuals to speak and write. He is also a student at M.S.U., expecting to receive his Bachelor of Science multi-disciplinary degree in computer science and linguistics in 1984.

Tim Dooley, a student in Woodstock, NY, tests an experimental prototype of his optical hand operated joystick. Tim's system is based on the Jim Brooks system.

A Voice

Dr. John Eulenberg is the director of the Artificial Language Laboratory in the Computer Science Department of Michigan State University in East Lansing. He has been working for more than 20 years in the combined fields of computers and linguistics, pioneering methods of vocal output for the severely speech disabled.

I attended the banquet given at the San Diego Computer Fair, at which Dr. Eulenberg gave the keynote address relating to his work in this field. I was particularly interested because I had led a symposium on speech synthesis at the same convention.

Jim Brooks languished for the first 23 years of his life, unable to speak, the victim of spastic athetoid cerebral palsy. The words he attempted to utter were unintelligible, and because he was unable to communicate, he was thought retarded. Only his parents knew the truth.

Dr. Eulenberg saw in him a man in need of a voice with which to express himself: he could tell that Jim Brooks had plenty to say. Eulenberg led a team of scientists to develop a system that Brooks operates with his right foot, the only part of his body over which he has control.

A computer system is attached to the

wheelchair from which Brooks uses his foot to manipulate a joystick, enabling him to type out words or parts of words. He can see what he is typing on an adjustable eye level 20-character alphanumeric LED screen. When he is finished typing, Brooks commands the computer to speak for him through a voice synthesizer.

The system, called the VOCA (Voice Output Communication Aid) consists of three components: a power distribution unit, a printer/display unit, and an 80-position foot pedal. The system draws on the same batteries which supply power to the wheelchair motor. The pedal swings in an arc from left to right or up and down within a 10 by 8 matrix that gives Brooks 80 positions from which to choose. These positions correspond to single letters, commonly used words and phrases, and control functions.

Once he was able to communicate, Brooks was found to have an outstanding mind and is studying computer science and psychology. One of the most moving moments that arose out of his new found ability of 'speak' was the invocation he gave in front of the Michigan legislature that earned him a spontaneous standing ovation from the assemblage.

Once he was able to communicate, Brooks was found to have an outstanding mind and is studying computer science and psychology.

S.A.M.

In a similar vein, *S.A.M.* (Software Automatic Mouth) from Don't Ask Software is a program that generates speech. It requires a digital-to-analog converter and works differently on the three computers for which it is available. *S.A.M.* for the Apple II is $124.95. A digital-to-analog converter is supplied with it. The price for the Atari and the Commodore 64 is $59.95 as no additional hardware is necessary.

Joe Laughran of Baraboo, WI, like Jim Brooks, was unable to speak because of severely disabling cerebral palsy. Supplied with an Atari computer and the *S.A.M.* program, he too found voice, and for the first time a sharp mind was able to express itself.

Don't Ask Software is located at 2265 Westwood Blvd., Suite B-150, Los Angeles, CA 90064. (213) 477-4516.

KoalaPad

By now, it is safe to assume that practically everybody involved with computers has heard about, read about or used the KoalaPad from Koala Technologies Corporation, a graphics device that allows you to draw freehand or execute perfect circles, lines, squares, et al. with brush strokes and color options. As an input device, it can also be used as a game controller that is especially useful for the handicapped person with motor disabilities.

A six-year-old from Minnesota named Tommy is afflicted with cerebral palsy. Tommy has full range motion, but very little fine motor control. The touch table surface of the KoalaPad gave the boy enough stability for his hand so that he could use his finger to control the action game *Choplifter*. More important, it opens up a whole range of possibilities for Tommy and others with similar problems. The KoalaPad, though not designed for the handicapped, is a good example of an available product that can be turned into a useful tool with a little improvisation.

The KoalaPad Touch Table with *Micro Illustrator* software, available for the Apple, IBM PC, Commodore 64 and Vic 20, and the Atari 400 and 800 costs $125, from Koala Technologies Corp., 3100 Patrick Henry Dr., Santa Clara, CA 95050.

The KoalaPad is a good example of an available product which can be turned into a useful tool.

Chef

Here is a neat item for the visually impaired individual who is or wants to be a gourmet cook. Pop the *Computer Chef Cookbook and Recipe File* from Software Toolworks into your computer and listen to the voice synthesizer tell you about recipes that range from Chicken Mole to Tofu Quiche and Double Fudge Brownies to Strawberry Pizza. The *Computer Chef*, very moderately priced at $29.95, is a sophisticated database management program that allows you to search for recipes by title, keyword, or ingredient.

The program also has a very nice scaling feature that will refigure amounts for as few or as many people as you have to feed. There are more than 70 recipes that come with the program, and you can add your own with a text editor. An additional disk of 200 recipes costs $19.95, and you can get 100 of the best recipes from Wok Talk for $29.95.

This is a quality program from a company with an excellent reputation. It is available in CP/M and MS-DOS formats. Software Toolworks is located at 15233 Ventura Blvd., Suite 1118, Sherman Oaks, CA 91403. (213) 986-4885.

These are just a few of the numerous items that make life easier for the handicapped person. I will bring as many as possible to your attention in the succeeding months. ■

I'd rather have a 10-speed bike.

Animating Turtle Graphics

Logo Type

Jim Muller

Lights! Camera! Action!

There is a little bit of Steven Spielberg or Walt Disney in all of us. Staring at the computer screen, it is very easy to envision all sorts of grand and glorious programs passing before your eyes.

Putting those displays there can be a very intimidating experience, however. Arcade-style graphics are marvels of machine language programming, not something novice programmers can jump into right away. Low-resolution graphics don't have much to offer, and high-resolution graphics get to be a bit complicated.

Logo is a good place to start. It is a very friendly, interactive language that allows even very young programmers to get actively involved with animation very quickly. Sprites are one feature of Logo which can be used for animation. But sprites have distinct limitations. And all versions of Logo don't offer sprites. So let's take a look at what can be done with Turtle Graphics. This feature is in all versions of Logo and several other languages as well.

Last spring, the Young People's Logo Association started out with a relatively simple procedure to develop a picture of Puff, The Magic Dragon. It was a static picture using simple geometric shapes: triangles and arcs.

Some people obviously enjoyed Puff, because soon he was chewing his dinner. Then we received a letter showing us how to make Puff breathe fire. From Australia came a letter changing Puff into a more ferocious dragon. And now, we have a colorful winged dragon eating dinner, breathing fire, and blowing smoke. It has been a lot of fun watching Puff evolve. More importantly, it is a nice simple example of how Turtle Graphics drawings can come alive on the screen.

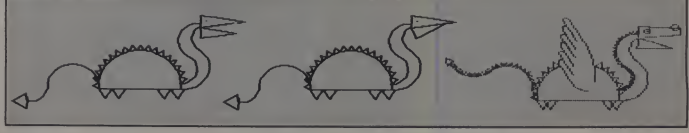
Animating Turtle Graphics is done much the way animation is done in cartoons. You really have to think about each action you want to have your figure make. In this case, Puff is drawn first with his mouth open. The lower jaw has to be erased and then redrawn again to show the mouth shut. The closed mouth then has to be erased and shown to be open again.

The flickering fire is made by drawing a red line coming out of the dragon's mouth, erasing it, and then drawing it again coming out at a slightly different angle. It alternates between the two angles to give the appearance of flickering flame. The same procedure is used to create the smoke rising from the nostrils.

Sometimes, you have to do a lot of experimenting to get just the effect you want. But that is half of the fun. It is fun to put your ideas down on paper, and then draw them on the computer. This helps you think through what you want to accomplish.

There are some very practical problems you must keep in mind when doing animation in Logo. First of all, remember that the Turtle draws much faster when hidden using HT or Hideturtle. Also, the Turtle draws straight lines much faster than curves. If your version of Logo has a PENREVERSE command, that can speed up the drawing and erasing of lines.

Of course, no Turtle Graphics drawing will move as quickly or as smoothly as an arcade game. Interpreted language can never do things as quickly as machine language programs. But experimenting with and modifying the following programs will give you an idea of what is involved in animated graphics. ■



Listing.

```
TO BREATHE
REPEAT 5 [FIRE RIGHT 5 FIRE LEFT 5]
REPEAT 8 [SMOKE]
END

TO SMOKE
PENUP
SETPOS [127 95]
SETHEADING 30
PENDOWN SETPC 1
FORWARD 12 PENERASE BACK 12 PENDOWN
END

TO WINGS
PENUP
SETPOS [40 25]
SETHEADING 0
PENDOWN
REPEAT 6 [FORWARD 8 LEFT 5]
FORWARD 40
REPEAT 6 [TIP]
BACK 20 LEFT 180
REPEAT 7 [FD 3 LT 10]
END

TO TIP
REPEAT 10 [FORWARD 1 LEFT 18]
FORWARD 30 BACK 20
LEFT 180
END

TO FLAME
FORWARD 50
PENERASE
BACK 50
PENDOWN
END

TO EYE
SETPC 4
PENUP SETPOS [194 90] PENDOWN
CIRCLE 3
SETPC 1 DOT [197 90] SETPC 2
END

TO CIRCLE :R
REPEAT 36 [RIGHT 5 FORWARD .174532 *
  :R RIGHT 5]
END

TO NOSTRILS
PENUP
SETPOS [124 95]
PENDOWN
CIRCLE 4
END

TO UPPER.JAW
FORWARD 15 RIGHT 94 FORWARD 45 RIGHT 86
FORWARD 9 RIGHT 86 FORWARD 45 RIGHT 94
EYE
NOSTRILS
PENUP
SETPOS [87.9909 81.7679]
PENDOWN
END

TO LOWER.JAW
RIGHT 180 FORWARD 13.9
LEFT 100 FORWARD 40
LEFT 140 FORWARD 40 RIGHT 80
END

TO OPEN
SETPC 0 LOWER.JAW
RIGHT 21.5 PENDOWN SETPC 2 LOWER.JAW
END

TO SHUT
SETPC 0 LOWER.JAW
LEFT 21.5 PENDOWN SETPC 2 LOWER.JAW
END

TO TRI :N
REPEAT 3 [FORWARD :N RIGHT 120]
END

TO HEAD
UPPER.JAW
RIGHT 10
LOWER.JAW
END

TO HALFCIRCLE :N
REPEAT 7 [FORWARD :N RIGHT 10]
PENUP
REPEAT 5 [FORWARD :N RIGHT 10]
PENDOWN
REPEAT 6 [FORWARD :N RIGHT 10]
END

TO FIRE
PENUP
SETPOS [87.9909 81.7679]
SETPC 4 PENDOWN
SETHEADING 95
FLAME
END

TO CHEW
PENUP
SETPOS [87.9909 81.7679]
SETHEADING 0 HIDETURTLE
PENDOWN RIGHT 10
REPEAT 3 [SHUT OPEN]
END

TO POINTS
START
SETHEADING -60
REPEAT 7 [TRI 8 RIGHT 60 FORWARD 8
    LEFT 50]
PENUP
REPEAT 5 [TRI 8 RIGHT 60 FORWARD 8
    LEFT 50]
PENDOWN
REPEAT 4 [TRI 8 RIGHT 60 FORWARD 8
    LEFT 50]
END

TO LEGS
START
SETHEADING 90
TRI 15 FORWARD 8 TRI 15
FORWARD 64 TRI 15 FORWARD 8 TRI 15
END

TO TAIL
START
SETHEADING 330
REPEAT 3 [FORWARD 5 RIGHT 10]
REPEAT 13 [TRI 5 FORWARD 5 LEFT 10]
REPEAT 11 [TRI 5 FORWARD 5 RIGHT 10]
LEFT 110 BACK 5 TRI 10
END

TO NECK
RIGHT 180
REPEAT 15 [FORWARD 5 LEFT 10]
REPEAT 12 [RIGHT 10 FORWARD 3]
LEFT 60
HEAD
SETHEADING 0
FORWARD 5 LEFT 90
REPEAT 15 [TRI 4 FORWARD 4 LEFT 10]
REPEAT 12 [TRI 4 FORWARD 4 RIGHT 14]
END

TO BODY
HALFCIRCLE 8
FORWARD 8 RIGHT 90
FORWARD 90 BACK 90
END

TO START
PENUP
SETPOS [-25 0]
PENDOWN
END

TO PUFF
HIDETURTLE
SETPC 2
START
BODY
NECK
TAIL
LEGS
POINTS
WINGS
REPEAT 3 [CHEW BREATHE]
END
```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Notebook Computing

David H. Ahl

Bit-Mapped Graphics and IBM Compatibility

Morrow Inc. recently introduced a nine-pound portable, the Pivot. Based on the 80C86 mpu, the unit has 128K (expandable to 512K), a 5¼" floppy disk drive, serial and parallel ports, a real time clock, and an LCD screen with 480 x 128 pixel bit mapped graphics. In text mode, it displays 16 lines of 80 characters.

The Pivot uses low power CMOS

The Morrow Pivot.

chips throughout and can be powered from an optional NiCad rechargeable battery pack ($50) or AC line. In size, the Pivot falls between the transportable and notebook computers measuring 13" x 9.5" x 5.6". Rather than the display tilting up from the keyboard, the keyboard folds forward from the display and lies flat on a desk. Price is $2500.

Olivetti M10 Notebook Computer

Docutel/Olivetti recently announced that it would market its M10 notebook portable computer in the U.S. The machine is made by Kyocera in Japan and is essentially identical to the Tandy Model 100 and NEC 8201. The M10 carries a list price of $799 for the 8K version and $999 for the 24K version. Given the substantial discounts available on the Tandy and NEC computers, it is unlikely that Docutel/Olivetti will be able to hold to these prices. (The recent street price for a 16K 8201 was $419.)

Like the Model 100, the M10 includes five bundled software packages for Basic, text editing, telecommunications, address filing, and scheduling. It also has a built-in modem and interfaces for parallel printer, RS-232 device, and cassette tape.

Along with the computer, the company also introduced a battery powered, four-color printer/plotter, the PL10. This companion device to the M10 has a list price of $260.

IBM Compatible Portables

International Quartz of Hong Kong has introduced three IBM PC compatible portable and transportable computers which use an 80186 mpu with 128K (expandable to 640K) and a 25-line LCD display.

The Model 9240 is a largish notebook-size unit (15.4" x 12.2" x 3.5") which weighs 15 pounds. The display tilts back (similar to the Sharp and HP machines), and housed in the back right of the case is a 5¼" double density floppy disk drive (similar to the Apple IIe). A "strap-on" printer is an optional extra.

The Model 9230 is a transportable with a built-in 80-column dot matrix printer and dual 360K floppy disk drives. It has a detachable intelligent keyboard that displays computer functions on its three-line LCD screen. Detached, it fits inside a briefcase for word processing and limited computing while traveling.

The Model 9231 is a conventional transportable with CRT display and dual floppy disk drives. It is available

International Quartz Model 9240.

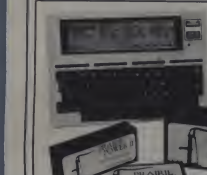
with or without the intelligent keyboard and weighs 35 pounds. No prices were announced.

Long-Life Rechargeable Batteries

When you bought your Model 100 or NEC 8201, did you realize that you also should have bought some shares of Union Carbide or Duracell? On one recent trip to Japan, I went through four sets of A-cells—enough to make me paranoid enough to turn off the com-

puter just to answer the telephone. Although at home I use a battery eliminator, I still go through three or four sets of batteries every month for an annual battery bill of $150 or so.

If you don't mind adding a few pounds to your briefcase, Bluestem Productions has an answer to the A-cell problem. Three rechargeable batteries



Prairie Power rechargeable batteries.

marketed as Prairie Power are available: 8 ampere hour (150 to 160 hours of service for a Model 100 or NEC 8201), 5.5 amp. hr. (90 to 105 service hours), and 2.6 amp. hr. (50 service hours). Each unit comes with a 5.6-foot cable. The units cost $34.95, $29.95, and $21.95 respectively.

Bluestem also sells a charger/battery eliminator for $10.95, however with a short length of wire and a couple of alligator clips, you can use the Radio Shack or NEC units (just be careful about polarity!).

I've been using the 8 ampere hour Prairie Power unit for the past three months, and it hasn't run down yet. I'll let you know when it does. On the other hand, at 3.6 pounds and 6" x 4" x 2", the weight and size are not insignificant. Still, compared to all those sets of A-cells, it seems like a good bet.

Flight Planning on Notebook Computers

We recently got a long letter from K.C. de Miranda of the ICAO Technical Assistance Bureau. For several years, Mr. de Miranda has been promoting the use of microcomputers in aviation. He has written several articles for the ICAO bulletin on various applications of microcomputers in civil aviation, including load planning, route planning, and flight planning.

Most recently, he has designed a flight planning and flight execution program for the NEC 8201. One program module is used to prepare an operational flight plan for up to five flight route legs. The program accepts as input navigational data such as checkpoints; true airspeeds, windspeeds, and velocities; true courses; magnetic variations; altitudes; and fuel consumption rates. The program computes leg times, accumulated flight time, true headings, magnetic headings, ground speeds, wind components, and fuel consumption for each leg of the flight. A second module allows the program to be used for flight execution by the cockpit crew.

Readers who are interested in these applications may wish to write to K.C. de Miranda, 39 Northview Ave., Montreal, Quebec, Canada, H4X 1C8.

Prop Legs for Notebook Computers

If you would like to prop up the back of your Model 100, NEC 8201, or Epson HX-20 to a more comfortable typing/viewing angle, KJM has just the product. A pair of Prop Legs with non-skid rubber feet elevates the back of the computer about 1¼". We found this a tad too much for our liking and trimmed ¼" off for us to give a standard 10-degree tilt to the computer—a pretty neat product for $5 a pair postpaid.

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10 POUR X:"TO 3: ECRIVEZ "BONJOUR":FAIRSATE

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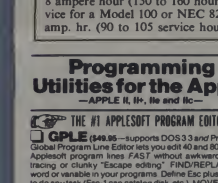
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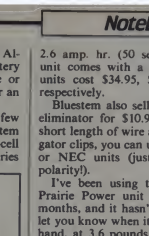
I USED APPLE MECHANIC ROUTINES IN MY APPLESOFT PROGRAMS. ONLY HAD TO CREDIT BEAGLE BROS IN MY DISK AND MANUAL
5 LIST: LIST: LIST: LIST
6 FOR C=1 TO 40: POKE 33,C: PRINT: NEXT: GOTO 5



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Printer Formatting Programs

Within weeks of the announcement of the Tandy Model 100 and NEC 8201 notebook computers, software manufacturers recognized that the print formatting built into the computers left a great deal to be desired. Several programs which provided additional features soon made their appearance. Now, a year later, there are at least ten such programs on the market. We obtained six representative ones and used each one for a few weeks to give us a good feel for it.

We have reviewed some of these programs singly in past columns. However, for this roundup, we have prepared a chart of essential features and "nice to have" features. You will notice that generally the more features a program has, the bigger it is. Given that memory is still a precious commodity in notebook computers, you will probably want to look for a program that provides an adequate number of features for your needs and requires as little memory as possible.

Generally the more features a program has, the bigger it is.

Several of these programs have capabilities far beyond simply print formatting. For example, *Autopen* (formerly *Scribe*), *Elf-Writer*, *Journalist*, and *Write+* all allow dot commands similar to those in *WordStar* to be embedded in the text. *Elf-Writer* has a particularly rich command set; it also has an edit mode with a "ruler" line at the bottom of the screen. *Journalist* (also called *T JOURN* AND *N JOURN*) has a nifty feature that allows you to preview the output format, page by page, on the bit-mapped graphics of the LCD display.

Model 100 Linefeed Patch

For some unknown reason, the computer designers in Fort Worth do things differently. In particular, all Radio Shack TRS-80 computers strip out the linefeeds from their print routines, thus requiring the printer to be set to "Carriage return implies linefeed," "Auto LF

```
10 ON KEY GOSUB 20,30:KEY ON
12 CLS:PRINT@130,"FCSG Line Feed Patch";:PRINT@281,"On    Off";
14 GOTO 14
15 DATA 245,58,172,250,254,13,194,48,245,62,10,50,172,250,241,201
20 CLEAR 256,62700:FOR I'=62754 TO 62769:READ A:POKE I',A:NEXT
25 POKE 64228,34 :POKE 64229,245: MENU
30 POKE 64228,243:POKE 64229,127: MENU
```

Linefeed Patch Program

Printer Formatting Programs

Essential Features	Format Ahl/ NEC	PortaPrint Skyline Marketing	Autopen Chattanooga Systems	Write + Port Comp Support Gp	Elf-Writer Ceres Software	Journalist AMPI
Set left margin	Yes	Yes	Yes	Yes	Yes	Yes
Set line length	Yes	Yes	Yes	Yes	Yes	Yes
Line spacing	1,2,3	1	Any	Any	Any	1-9
Set page length	Yes	Yes	Yes	Yes	Yes	Yes
Page numbering	Yes	Yes	Yes	Yes	Yes	Yes
Header (or footer)	Yes	Yes	Yes	Yes	Yes	Yes
Handle tabs in text	Yes	No	No	No	Yes	No
Optional halt at end of page	Yes	No	Yes	Yes	Yes	Yes
Nice-to-have features						
Right justfication	No	No	Yes	Yes	Yes	Yes
Print selected part of text	No	No	No	Yes	No	Yes
Embedded commands:						
Centering	No	Yes	Yes	Yes	Yes	Yes
Right justify	No	Limited	Yes	Yes	Yes	Yes
Page feed	No	Yes	Yes	Yes	Yes	Yes
Change margins	No	No	Yes	Yes	Yes	Yes
Activate printer features	No	No	Yes	Yes	Yes	Some
Program size (bytes)	1440	1515	3081	4100	8044	6166
Free memory to run	256	512	1000	2000	2670	6860
Print speed	Slow	Slow	Fast	Fast	Fast	Fast
Price	(1)	(3)	$29.50	(2)	$39.99	$99.95

(1) Free from NEC to 8201 owners
(2) One of six programs with *Businesspak* at $89.95
(3) Free with the purchase of *PortaCalc* at $69.95

after CR," or the like. This is different from practically every other computer on the market, most of which send a linefeed character to the printer following a carriage return.

If you have only a Radio Shack computer and printer, fine. But if you have more than one computer or want to use someone else's printer, you have a problem. To overcome this problem, Michael Stanford and Rob Robinson at the Portable Computer Support Group wrote a short program that intercepts the printer driver and prevents it from stripping out the linefeeds following the carriage returns.

It is with some trepidation that they offer the patch, since it redirects a system jump vector into user memory. They note that if you load a program that clears memory above 62700 decimal, the results are unpredictable, and probably disastrous if you try to print anything. Under most circumstances, the patch will present no problems; indeed we ran all the text formatting programs mentioned above with it with no problems at all.

Blow Up Your Model 100

I have been given a 13-line program written by Art Wong that absolutely, totally, and irrevocably wipes out a Model 100 (and probably a NEC 8201 also). Art speculates that it somehow screws up ROM, although I don't think this is possible. He thinks he can make the program shorter, although it is difficult to experiment with such a thing as you need a new machine for each run.

In any event, I am not publishing the program lest it fall into the hands of someone with a grudge against Radio Shack or NEC. But I am curious to know if any reader has had his computer go out to lunch for no apparent reason—and when I say "out to lunch," I mean nothing fixes it short of a new logic board. And if so, has anyone determined the cause?

Down in Page 0

Terry Monks, a confessed machine language hacker ("When I was a young programmer, I loved to curl up in front of a warm fire with an OS-360 dump and follow the pointers around") wrote an article for this column with several short programs to explore the internal structure of the NEC 8201 and Model 100. It is a bit too long to publish and a bit too much on the hacker side. However, if it doesn't show up in some other magazine and if you would like to know what is stored down in page 0 in the Basic token tables, I'm sure Terry would be happy to hear from you (for courtesy, send a SASE).

He notes that there are several commands in the token table which are not described in the manuals: DSK1$, DSK0$, and FORMAT (probably for later use with a disk system), as well as COLOR AND CMD.

If you have more than one computer or want to use someone else's printer, you have a problem.

Thanks and a tip of the hat to Terry Monks, 11122 Saffold Way, Reston, VA 22090. ■

Firms Mentioned in this Column

American Micro Products, Inc. (AMPI)
705 N. Bowser
Richardson, TX 75081
(214) 238-1815

Bluestem Productions
P.O. Box 334
Wayzata, MN 55391
(612) 471-7795

Cerces Software, Inc.
P.O. Box 1629
Portland, OR 97207
(503) 245-9011

Chattanooga Systems Associates
P.O. Box 22261
Chattanooga, TN 37422
(615) 892-2339

International Quartz Ltd.
23505 Crenshaw Blvd.
Torrance, CA 90505
(213) 539-8944

KJM Development
P.O. Box 698
W. Hartford, CT 06107

Morrow Designs Inc.
600 McCormick St.
San Leandro, CA 94577
(415) 430-1970

Portable Computer Support Group
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CIRCLE 186 ON READER SERVICE CARD

Transtar 130 and Inkjet Technology

Print About Printers

John J. Anderson

Howdy once again, faithful readers. Welcome to the wacky, wonderful world of hard copy. Here the most challenging intellectual inquiries resolve into the issue of dots per inch. Here the mysteries of time are reduced to comparative slew rates. It is a world of absolutes here. It's all in literal black and white.

This time around we will test drive the Transtar 130 daisywheel printer, take a look at Hewlett Packard's aggressive new printer line, and peer into the mail bag. So let's get going.

Transtar Quality

In the February 1984 issue of *Creative Computing*, we reviewed the T315 color printer from Transtar. We concluded that the T315 offered quality color ribbon performance for an extremely reasonable price.

This month we had the opportunity to evaluate the Transtar 130, a low-priced daisywheel printer with nearly all the features of its upscale cousins. The 130 uses a 96-character plastic daisywheel to produce fully-formed, letter quality print (Figure 1). Its print speed is 16 cps, in switch-selectable 10 or 12 pitch modes. Its wide carriage accepts forms up to 17" in width.

Linefeed speed is four inches per second, with a carriage return speed of 1350 ms. Thus the 130 is about average in overall throughput speed. Horizontal spacing is software-selectable in $\frac{1}{120}$th" or $\frac{1}{180}$th" increments. Vertical line spacing is constant at $\frac{1}{48}$th" increments.

The unit connects easily to all popular micros via a Centronics parallel 36-pin Amphenol. It is plug and software compatible with Diablo 1610 routines for compatibility with most leading word processing packages.

The cartridge ribbon used in the Transtar 130 is Olivetti-compatible, so users should find replacement cartridges easily. They can choose between multi-strike fabric and one-pass mylar ribbons.

Form length is software-selectable from 1 to 126 lines. Paper thickness is adjustable up to five sheets.

If you are looking for a large machine, the 130 is for you. It has a very large footprint—23" x 14" x 7.5"—which more or less cries out for its own printer stand. Put it on a desk, and you will wonder where the desk went. I could be wrong, but I don't think you will find a less expensive daisywheel printer with a 17" platen.

Installation of the printer is easy, and you should have no trouble inserting printwheels or ribbon cartridges. I found it refreshing that the DIP switches are placed so that no disassembly is necessary to configure them.

The control panel on the Transtar 130 is color-coded. It has been designed specifically for ease of use, and on that account, works very well. In traffic light style, a green lamp indicates printer power is on, an amber lamp indicates on-line status, and a red lamp flashes on to indicate an open cover, ribbon jam, or missing printwheel. Similarly, color-coded buttons allow for pause, linefeed, page eject, and single sheet autoload.

The autoload feature is probably the most unique aspect of the machine. The 130 ships with a paper feed tray that nestles behind the platen. You can rest a single sheet on the tray, then autoload it to a selected position using the autoload feature. Four positions are available: the first printable line on the cut sheet; 1" down from the first printable line; 1.5" from the first printable line; and 2" from the first printable line. Header positions are set from the DIP switches.

In what has become an informal standard, powering up the printer while holding down the linefeed switch invokes the self-test.

The documentation booklet is thin but

Figure 1.

```
,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
/0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrs
./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqr
-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
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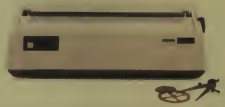

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CIRCLE 169 ON READER SERVICE CARD

thorough, clearly written, and well-illustrated. It provides all the information needed to install and begin running the Transtar 130.

For a list price of $699, the Transtar 130 proves to be a good performer. I found it to be somewhat noisy, but that is true across the board for daisywheel printers. If you must have letter quality, must economize, but want something slightly better than the least expensive available, the 130 is for you. I have already spied substantial discounts.

CIRCLE 451 ON READER SERVICE CARD

ThinkJet Revisited

In the July 1984 issue we reviewed the Hewlett Packard 110 portable computer. Upstaged in that piece was the ThinkJet printer, a $500 miracle of HP savvy. Though a mini-review of the ThinkJet appeared then, let's take a bit of time to examine it more closely.

The printer utilizes inkjet technology (see sidebar) to round-up an incredible set of specs. Print speed is up to 150 cps, at a sound pressure of less than 50 decibels. This simply means you can talk on the phone right next to an operating ThinkJet, turning out three pages a minute. Resolution is 96 x 96 dots per inch in text mode, or 192 x 96 dots per inch for graphics printing. Four pitches are available, ranging from 12 to 21.3 cpi.

With these kinds of features, it is hard to believe that the ThinkJet measures in at just 11.5" x 8" x 3.5", the size of an average collegiate dictionary. At 5.5 lbs., it is lighter than that same dictionary.

And with the battery-powered model, you can take your ThinkJet on the road. The rechargeable built-in ni-cad battery pack can pump out 200 pages per charge. Now you can get the performance of a desktop printer in the size of a portable.

And that's not all. The print sample that appeared in the July issue was done on standard fanfold paper and looked quite good. At Comdex, however, I got a chance to try out specially designed ThinkJet paper, which resulted in even more remarkable print quality (Figure 2). As an added bonus, ThinkJet paper decollates without rough edges, for the look of single sheets with the convenience of continuous forms.

A Centronics version of the ThinkJet is now shipping. I predict it will become one of Hewlett's most popular products.

The LaserJet

At Comdex, HP also introduced another revolutionary printer, dubbed the LaserJet. Eight times faster than a typical daisywheel printer, the LaserJet brings laser technology to offices and small business at a list price of $3495.

The machine can reproduce eight pages per minute, while maintaining print quality nearly indistinguishable from copy produced on an electronic typewriter. And it does so with even less noise than its little brother, the ThinkJet.

Graphics resolution of the LaserJet can provide nearly typeset quality, with

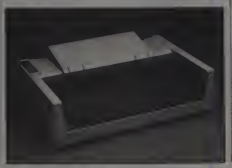
ThinkJet Inkjet

The advent of the ThinkJet printer is significant for two reasons: its miniaturization of inkjet technology, and the fact that it breaks the $500 barrier with that technology.

Inkjet printers are becoming more and more popular, and yet the technique used to get the print onto the page is not widely understood. Here is a thumbnail sketch of the operation of the Thinkjet:

The entire printhead used in the ThinkJet printer is disposable. Inside each cartridge we find a liquid ink supply and twelve microscopic nozzles. Each nozzle can supply a drop of ink "on demand" when it receives a signal, as the printhead scans across the paper.

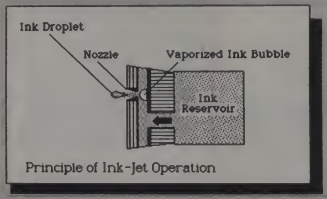
The process of ejecting each droplet is shown in the accompanying diagram. A small volume of ink is instantaneously vaporized behind the nozzle. The vapor bubble grows rapidly, and when it bursts, it propels the ink ahead of it through the nozzle itself and out onto the paper.



Capillary action draws new ink into the nozzle to await the next jet signal. As the ink is used up, the thimble-shaped rubber ink reservoir behind the printhead collapses, like the bulb on an eyedropper. This maintains a constant back pressure to supply ink to the printhead. Each cartridge will print up to 500 pages of text.

When the cartridge is spent, it is removed and replaced. As there is no printhead mechanism *per se*, the entire printhead cartridge can be replaced at low cost. Replacement cartridges cost about $10 each.

The immediate benefits of such a print method are quiet operation and a high-resolution dot matrix. There may come a time when impact matrix printers become the old-fashioned way to get hard copy.



Principle of Ink-Jet Operation

The printhead for the HP Thinkjet personal printer is conveniently disposable and easy to reload.

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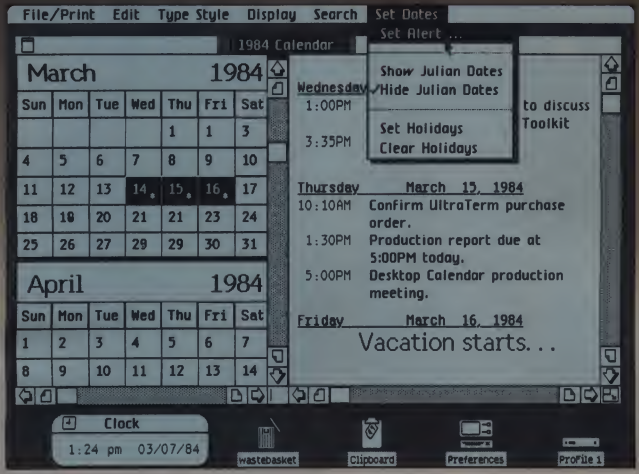

Desktop Calendar for your Lisa 2

Desktop Calendar, a new tool for the Lisa 2, will improve the way you work because it helps you manage your time.

Your're an important person. Working hard to get the job done. But what happens if you get so involved in your work that you lose track of time? Missing an important appointment or meeting can mean disaster.

If you put the times and dates of all your important appointments and meetings into Desktop Calendar, it will automatically remind you of them in time for you to meet your commitments. Once you place Desktop Calendar on your electronic desktop, you can use your computer to write a letter, recalculate a schedule, prepare a financial statement, or use any of the Lisa Office System Tools. At the proper time Desktop Calendar will interrupt, reminding you of your appointment.

Talking on the phone to an important client? Want to know all the dealings you've had with them for the last three months? Desktop Calendar will search through its electronic notebook and tell you. Want to know the address of an important business contact named 'JONES'? Desktop Calendar will tell you that too.

Desktop Calendar is more than just a calendar for your computer. It will also keep track of appointments, hold addresses for easy reference and remind you of important events, even when you are busy working with another tool in the Lisa Office System.

Desktop Calendar will be available third quarter 1984 from Videx.

Videx Inc
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CIRCLE 200 ON READER SERVICE CARD

```
    THE AUGUST 1984 ISSUE OF CREATIVE COMPUTING WILL BE
UNIQUE IN MICROCOMPUTER PUBLISHING, AND IS SURE TO HAVE A
LASTING EFFECT UPON ITS READERS. THE GOAL WE'VE REACHED IS
DEFINITIVE COVERAGE: TO THAT END WE HAVE DEVOTED MONTHS OF
WRITING AND RESEARCH.
```

Figure 2.

300 x 300 dots per inch.

The LaserJet is more easily compared to a copy machine than to other computer printers. In fact, it makes use of a disposable electro-photographic cartridge OEMed from Canon, which is actually an off-the-shelf copy machine component. Each cartridge is good for approximately 3000 pages of printing and costs $100.

Laser printer technology, which until very recently cost at least $10,000, may ultimately replace even ink jet technology. We'll take a closer look at laser printing in an upcoming column.

Mailbag

To Dwight Hale, of Grand Forks, ND:

I have never been much of a believer in electronic typewriters that will double as computer printers. They are simply not designed for the kind of continuous, high-speed throughput that a computer will deal out. I have heard more than one tale of horror from a micro owner who has gone that route. My advice would be to invest in a quality *computer* printer. You'll save enough in repair costs to afford a low-cost electronic typewriter in no time.

Question is, who really needs a typewriter anymore?

To Edward Todd, of San Antonio, TX:

The NEC 2050 is indeed designed so that a person with utterly no special skills can install it and get it running. That is the whole idea behind the plug-in interface modules.

I have made no determination as to whether print thimbles are more or less reliable or durable than daisywheels. I would guess that they are about the same. Top-end Spinwriters are faster, because a print thimble can shortcut to any character position, unlike a daisywheel. However, that is not an issue with the NEC 2050, which is about as fast as a similarly priced daisywheel.

As to what editors consider letter copy, I can speak only for myself. I would never reject a manuscript simply because it was printed in dot matrix. But I do reject illegible manuscripts. I would rather read a legible dot matrix manuscript than an illegible impact copy any day. As for this "letter quality" shibboleth, well, it is by now nearly devoid of all meaning. The fact is that daisywheels are slow and monospaced. New dot matrix printers such as the Toshiba 1350 and the Epson LQ-1500 can produce proportionally spaced copy that to my eye is superior to daisywheel—nearly typeset in its quality.

To Bernard Suchman, of San Francisco, CA:

For a while, it seemed that parallel printers would win the day and that serial printers were doomed to extinction. The Centronics standard caught on and for a while it stuck.

Now serial printers have re-emerged on some very popular systems. The Apple Imagewriter, de facto Macintosh printer, is a serial machine. The Apple IIc sports only a serial printer port. The HP-110 version of the ThinkJet is serial, as are the HP LaserJet and many other new printers.

If I have ever implied that parallel printers are inherently better than serial, it was inadvertent. Neither is in practice faster, more reliable, or simpler to interface than the other. What may have confused you were my urgings for some standard to be fully adopted. I would have liked to see the Centronics parallel interface become standard not because it is better, but because it came as close to a real standard as we have seen in the printer industry to date. To turn around now and go back to the serial approach will ensure the continued existence of incompatibility between the two.

If it is to be serial, let's go serial! The core of the matter is to standardize, so we won't have to debate this question into interface eternity.

Okay. Off the soapbox. See you next month. ■

Firms Mentioned in This Column

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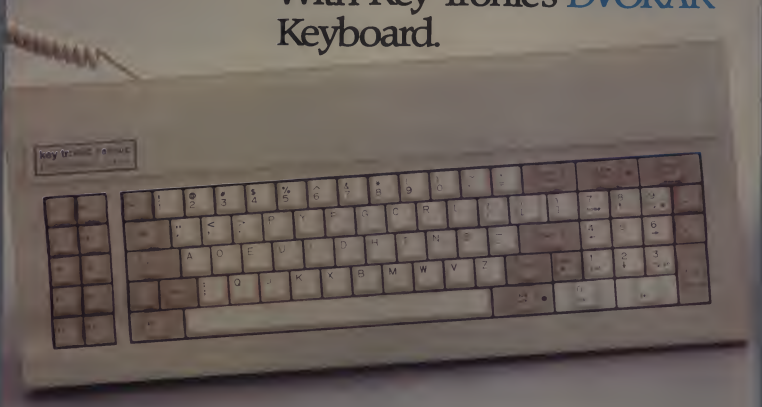

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CIRCLE 201 ON READER SERVICE CARD

Telecommunications Talk

Brian J. Murphy

How the year is flying by. It is September already and in just a few more days it will be fall and time for many of you to return to your desks in schools and offices. Until then, the evenings are free for us telecommunicators to connect to our favorite information utilities, to sample bulletin boards around the country, and generally to relax with our computers in a pleasingly aimless way. It is one of the special delights in this new age to spend a lazy summer evening, after midnight has come and gone, "chatting" with a new-found friend in California or Texas about everything in general and nothing in particular.

Now, some gladsome tidings from our own camp, regarding the newly created *Creative Computing* SIG (Special Interest Group) on CompuServe.

It was at the beginning of last May that the Creative Computing SIG was brought into being on CompuServe. The gestation process was a little rough for reasons we will not detail here, but which concerned red tape and technical problems of one sort or another. The final result has been a service which is interesting, lively, and popular—even if we do say so ourselves.

As the *Creative* staff envisions it, the SIG will serve several purposes. The most important of which is to act as a conduit for two-way communication between the people who create the magazine and the people who read it and use it. No magazine can hope to survive long if it doesn't keep in touch with its readers. *Creative's* ten year run is testimony to its recognition of that fact, and the SIG is a token of a commitment to even better communications.

We also wanted to expand the services that *Creative* offers to its readers, by getting the information from the magazine to its readers in a truly accessible form. Let's examine now how the SIG accomplishes these goals.

As you enter the SIG, you discover that it is formatted like most of the other CompuServe SIGs. There is a greeting message, more than likely from John Anderson, and a menu of options:

1 (L) LEAVE A MESSAGE
2 (R) READ MESSAGES
3 (RN) READ NEW MESSAGES
4 (RM) READ WAITING MESSAGES
5 (B) READ BULLETINS
6 (CO) ONLINE CONFERENCE
9 (OP) CHANGE YOUR SIG OPTIONS
0 (E) EXIT FROM THIS SIG

There is no private messaging in the SIG so bear in mind that anything you have to say will be read by others.

Options 1 through 4 allow you to leave messages for other SIG members and to read messages that have been left in the file, either from the beginning of the existing message or starting where you left off the last time you were on line. There is no private messaging in the SIG (E-Mail is more appropriate for that), so bear in mind that anything you have to say will be read by others—which is where the fun comes in. You may reply to any message you see, even if it isn't addressed to you.

Option 5 plays back current bulletins placed in that file by the system operators (sysops). Choice 6, Online Conferencing, is a CB simulation which allows you to chat with other users on as many as 30 "channels." A help file that comes with this choice explains the various commands and procedures. This system is used primarily for conferences at set hours.

Nine Data Files

The nine XA sections contain data files broken down into specific areas of interest. By typing XA1 at the ENTER SELECTION OR H FOR HELP prompt you will be taken to the first set of data files. The XA1 files are designated as the NewsWire. The files here contain late-breaking news, views, and rumors, coming attractions, special announcements of interest to SIG members, errata, and other notices.

The XA2 files promise to be among the most popular because they will contain the Street Price Index. The index will be kept meticulously up to date to offer users an invaluable aid in pricing computer hardware and software and in negotiating price with computer merchants ("Whaddaya mean $199? The Street Price Index says I can find Atari 600XLs for $149!). Computers included in the Index include Apple IIe, Atari 800XL, Commodore 64 and other popular models. You will also find prices of ten printers, seven monitors, and 20 popular software packages.

Another XA3 database feature is the *Creative Computing* benchmark test results. The test uses a simple program to determine computational speed and accuracy. As of this writing 183 computers had been tested, ranging from the ultra-powerful

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MCI, the "Nation's New Postal System," and it's now available to AFTER DARK subscribers. Light years more sophisticated than other terminal-to-terminal services, MCI Mail also gives you options of overnight, overnight-by-noon and four-hour delivery. And if you're sending to someone without a computer, you can even have MCI print the message on their high speed laser printer and mail it from the nearest city!

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Cray I mainframe (which completed the calculations in one-hundredth of a second) to the Texas Instruments SR-50 calculator (which took more than 12 days).

In the XA7 database you will find files of articles and information revolving around Apple products. You will also discover material from our Apple Cart column.

The XA databases are not one-way streets. You can add your own files.

The XA4 database contains files on Commodore products and material from John Anderson's column, Commodore's Port. Atari users will find a similar service on the XA5 database where the files include material from Outpost: Atari. XA6 covers the TRS-80 series.

The catchall database is XA8, which features information on a variety of computers, including the IBM-PC and PCjr, Timex Sinclair, and all other popular home and business personal computers. In the XA3 database are the files relating to computer hardware and accessories such as printers, plotters, graphics pads, modems, and so forth. The XA2 database contains lively discussions of software and operating systems, to keep you current with the most recent innovations. The XA0 database is reserved for help files for users and for miscellaneous subject files.

Accessing a file on the XA database is actually quite simple, whether you have a specific file in mind or you just want to check out what is currently available. Let's quickly review the procedure to see how it's done.

Accessing a File

First, you select the appropriate database. If you were interested in an Atari file, you would first key in the command XA5 for the Atari files. This would result in a menu which, among other options, gives you the opportunity to browse through the files. After you select the browse option you get a /AGE: prompt. This allows you to select files entered into the database within a certain number of days. For example, an answer of 5 means that you will be shown only those files entered within the last five days.

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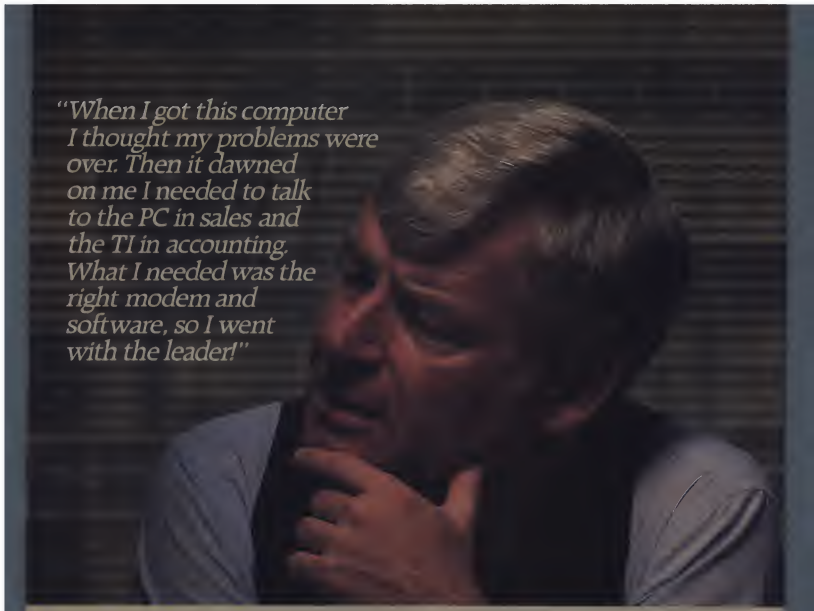
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Telecommunications

in response to this prompt, immediately locate and bring them up to the screen. A typical keyword would be "Outpost" for the Outpost: Atari column. If you don't want to search via keywords, then hit the RETURN or ENTER key, and the program will let you browse through all the titles.

Once you have the file you want, Outpost: Atari for example, you are given the choice of reading the file, downloading it or moving on. By downloading it to your own storage device you can keep a permanent record of the file. Similarly, you can use your printer to copy the file as you read it.

Your Input

The XA databases are not one-way streets. You can add your own files to the databases subject to the approval of the sysops. If, in their judgment, the material is relevant and useful, they will let the file stand, although they reserve the right to edit and cut the file as they see fit.

I am happy to report that as of this writing the SIG is an apparent success. Readers have been coming to us with their views, questions, and gripes. It has really been interesting to see how many people with systems like the Atari 800XL and the Color Computer are among our readers. This intelligence will almost certainly influence the way our editors see the magazine and the decisions they make when they decide to cover a specific machine.

Another encouraging aspect of the SIG has been its use as a place to upload and download files, using the XA databases. At first there was a little grumbling because we went on line without too much in the databases, but the readers pitched in and started uploading their own programs. Now this aspect of the SIG is healthy and burgeoning. It is definitely worth a look.

One of my favorite things about the SIG has been the way the readers and editors have maintained long and fascinating dialogues on the message system. An idle comment about possible Atari obsolescence by one reader led to a flood of messages from Atari users—who turned out to be extraordinarily dedicated to their machine, despite the way the company treats them. "Conversations" like these abound, and they don't lack for wit, wisdom, and information.

Take my advice and log onto the *Creative* SIG often. Jump into the stream of conversation on the message board. Download an interesting, free program. Participate in some of the exciting conferences that we are planning with top personalities in the computer software and hardware industry. Read the columns, the Street Index, the test reports, and have fun. See you on PCS-22! ■

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Port on Compuserve and Simon's Basic graphics

Commodore's Port

John J. Anderson

Hey there, Commodorians. I know you missed the column last month, and it feels good to be back. We have quite a few topics on the agenda, so let's get to it.

Avoid Save and Replace

As more or less an afterthought to the June column, I mentioned that a save and replace function does in fact exist for the Commodore 64 and gave its format. Since that time I have received letters and phone calls admonishing me for reiterating the information.

The problem with the save and replace command in its current form is that it is buggy. It will work fine for a while, then obliterate an innocent bystander file for no apparent reason.

The common mood of all those who got in touch was an undercurrent of melancholia resulting from lost data. Glen Johnson, of Sydney, Nova Scotia, summed it up, saying "Please, John. Recommend that people avoid that command like the plague."

Commodorians, avoid the save and replace command like the plague. Do all your file manipulation from the MiniDOS Menu program (more about that ahead).

Gibson Gibe

A trade paper recently reported that master light pen maven and micro-man-about-town Steve Gibson had some cruel words for the C-64 at a recent Apple shindig. "The thing looks overinflated," he was quoted to say. "Somebody ought to let some air out of it."

Well, Steve, you know how much respect I have for you, how much I appreciate your wit, and how much I like you as a person. So you won't really mind if I point out that the same occasionally could be said of you.

Sure, the C-64 has its faults—they are numerous, and many are far more than skin-deep (as this month's column underscores). But the C-64 is capable of great things; its potential is unlimited. I would guess that too can be said of you, Steve.

While I've basically been too reasonable to snipe at the looks of the C-64, there is one point upon which I could not agree more—the keyboard on the 64 does not feel as good as it should. The overinflation metaphor does hit home on this account.

It really feels like the keys are harder to press (more pressurized) on the Commodore 64 than on other machines. I've said it before, and it's time to say it again: Commodore, retrofit the keyboard you have on the SX-64 to the C-64. It has a much superior look and feel.

Menu Autorun Fix

At first I thought it was purely because our Commodore readers were so happy with the MiniDOS Menu programs (C-64 version, May; Vic-20 version, June) that so many wrote in regarding it. Then the truth hit—it was debug-time in the old Port once again.

Okay, string him up by his gums, he has screwed up again. But I can't really take 100 percent credit for this one. Part of it has to go to the occasionally rather quirky nature of the C-64 itself.

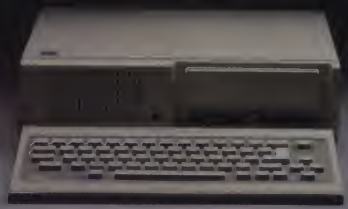
It seems that the autorun function, selectable from the main menu, will truncate certain programs during a load. If a program is shorter than nine sectors (the length of the Menu program itself) it will load and autorun as advertised. If the selected file is longer than the Mehu program, however, only the first nine sectors of it will load at all.

A good one, huh? Why does it happen? Don't ask me, I just work here. It's another "feature," like save and replace, you know. If anyone can hazard a guess on either weirdness, I'd sure like to hear it.

All I have discovered regarding the original autorun is that the technique was erratic. The latest revision of the MiniDOS was for a book I am writing (more on this to follow) within which nearly all programs are nine sectors or shorter. Hence I was convinced that the autorun command was functioning

Figure 1.

```
570 INPUT N$:PRINT "LOAD"+CHR$(34)+N$+CHR$(34)+",8□□□"
575 POKE 631,13:POKE 632,82:POKE 633,85:POKE 634,78:POKE 635,13:POKE 198,5:END
```



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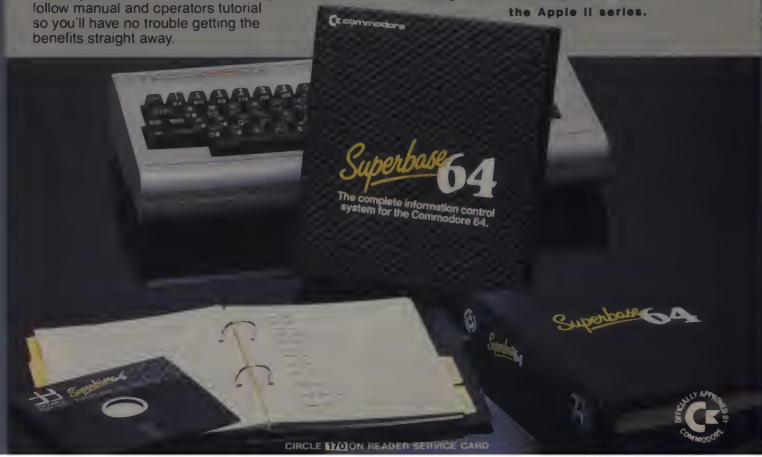

CIRCLE 170 ON READER SERVICE CARD

perfectly during testing.

In one case I got to a title screen on a 27-sector file, and assumed that the program had loaded properly. Had I tried to run it, I would have discovered that little more than the title screen had in fact made it into RAM.

Enough excuses. The fix for the Commodore 64 appears as Figure 1. I'm hoping that once I lay out the technique, one of our Vic readers will submit a Vic fix, sparing me the work. The idea is to POKE two carriage returns and a RUN command into the keyboard buffer. Then we fully load the specified program, which of course knocks the MiniDOS out of memory. Once the program is loaded, we pop the RUN command and another carriage return out of the keyboard buffer, and the program autoruns.

The fix consists of a modified line 570 and the addition of a new line, which we'll call 575. As you can see, this is less elegant than my original approach, which more or less listed as INPUT: LOAD:RUN. Really pretty, but as I've said, works only part of the time.

Here, line 570 asks for input, then types a legal LOAD command using the input string as the filename. Because we can't embed quotes within PRINT statements, we stick them in as CHR$(34)s. The three special graphics characters at the end of the line are SHIFT-CURSOR-UPS typed inside the quote mode. Don't forget them. They put the cursor where we want it to be when line 575 comes into play.

Line 575 literally packs the keyboard buffer with "phantom keystrokes." Location 631 is the start of the buffer. A 13 is the CHR$ equivalent of a carriage return, so our cursor, which has been repositioned over the LOAD command line, can be RETURNed, entering the line. The next values—82, 85 and 78—spell out the word RUN in CHR$ values. Then we add another value of 13, this time in location 635, allowing our "phantom typist" to press RETURN over the RUN statement once it pops out of the buffer.

The final POKE, in location 198, tells the C-64 how many characters to count out of the buffer. The total here is 5, and that is exactly what we POKE into location 198. So very simple.

So this approach, while quite a bit bulkier, is foolproof. It will load any size file, and autorun it without alteration.

Thanks for your otherwise largely kind comments regarding the MiniDOS Menu.

Commodore's Port on Compuserve

If you still don't have a copy of the MiniDOS Menu, one thing you now can do is download it from the *Creative Computing* SIG (Special Interest Group) on Compuserve. Yep, that's right, *Creative Computing* is on-line, and if you can get onto Compuserve, you can communicate with us directly anytime you want. You can download Commodore-specific articles, programs, and scuttlebutt too.

Just type GO PCS-22 at any exclamation prompt. Leave a message asking to become a member, and we'll validate you within 24 hours. Among other goodies, you will find an on-line version of Commodore's Port on the SIG, where

Creative Computing is on-line, and if you can get onto Compuserve, you can communicate with us directly anytime you want.

you can ask questions, give answers, and otherwise sound off. More programs for download are added to our databases every day.

So if you have a modem, give it a try. It could well become a regular thing. Get on-line soon, and show those Atarians that C-64s can telecommunicate, too.

Simon's Basic Sight and Sound

The debugged and fully-featured cartridge version of Simon's Basic is finally widely available, and it is about time. The language adds 114 commands to plain vanilla Basic, finally making the true power of the Commodore 64 available to the novice programmer.

If you own a 64 and are interested in programming, you owe it to yourself to pick up Simon's Basic. I am so impressed with the language, I am writing a book about it.

Because graphics and sound are my major interests, *Commodore 64 Sight and Sound* will deal primarily with the graphics and sound commands available from Simon's Basic. They are easy to use, and especially powerful.

Here, in an excerpt from *Sight and Sound*, is a look at just a few Simon's Basic low-res graphics commands, and examples of their use:

SCRSV and SCRLD

Perhaps the most important lo-res commands available from Simon's Basic are SCRSV and SCRLD. SCRSV stands for screen save, which allows you to save a lo-res screen. SCRLD, which stands for screen load, allows you to load a screen saved with a SCRSV command.

Instead of having to go through the trouble of keying in a program to load and save lo-res screens, as we did from plain old Basic, Simon's Basic has dedicated commands to make the job simple for us. They can be used in the direct or the deferred modes.

To save a screen to disk, you use the following command format:

SCRSV 2,8,2, "screen filename, S,W"

(screen filename is the name you have chosen for the screen).

The parameters other than the screen filename, which you will supply, will always remain the same—these tell Simon's Basic to open a file to disk, write screen data to it sequentially, and then mark it with an end-of-file marker.

To load a screen that has been saved to disk, follow this format:

SCRLD 2,8,2, "screen filename"

It is just that simple. The screen you saved as that filename will appear on the screen. Any lo-res screens, even those in color and using special graphics characters, can be saved in this manner. In this way you can preserve your lo-res works of art forever.

FLASH and OFF

Using the FLASH command is a good way to draw attention to the screen itself or to certain words on the screen. It can take either of two alternate formats:

FLASH color, speed

(color = 0—15, and speed = 1—255).

This command enables you to flash all characters in a single color, at a rate of speed that is selectable. The speed range may be any number from 1 to 255—with 1 as the fastest flash rate and 255 the slowest.

Alternatively, you may use this format:

FLASH color

(color = 0—15). This will flash a color at a default rate of once every four seconds.

To stop flashing when you are ready to do so, simply use the command OFF. The only trick to using the OFF command is to make sure to turn off the flashing when the characters are visible—otherwise you could run into problems with an invisible cursor.

As a remedy to off-timing FLASH, you could redefine cursor color after using an OFF command.

Listings 1 and 2 show a couple of uses of the FLASH command.

FILL

The command FILL allows you to fill a rectangular area of the screen (in a size

and location you choose) with text characters of a specific color and type. Command format is as follows:

FILL row, column, width, length, POKE code, color

(row = 0—24; column = 0—39; width = 1—24; length = 1—39; POKE code = code for selected text character; and color = 0—15).

The first four parameters in the FILL command define the area of the screen to be FILLed. Rows are numbered 0 to 24, and columns 0 to 39. The parameters row and column represent the top left-hand point of the FILL, and the parameters width and depth the size of the rectangular shape to be filled. The next parameter, POKE code, is the POKE code associated with the character that will comprise the fill. A list of POKE codes appears as an appendix in the *Commodore Programmer's Reference Manual.*

The final parameter is the color of the FILL character you desire. Listing 3 is one form that use of the FILL command might take.

MOVE

MOVE is an extremely powerful and useful command, that allows you to copy a section of the screen and move it elsewhere on the screen. The command format is as follows:

MOVE row,column,width,length, destination row,destination column

(row = 0—24; column = 0—39; width = 1—24; length = 1—39; destination row = 0—24; and destination column = 0—39).

The first four command parameters define the screen area you wish to reproduce. The last two specify the row and column coordinates of the top left-hand corner of the area where the screen will be duplicated.

Be sure that parameters you use do not result in a MOVE exceeding the limits of the screen. This means that the depth of the screen area to be duplicated added to the row number of the area into which the information is to be reproduced must not exceed 25. It also means that the column number of the area into which the data are to be reproduced must not be greater than 40. No MOVE command can execute if those parameters result in a BAD MODE error.

Listings 4 and 5 are some examples of MOVE commands.

So there you have it. Next month we continue our exploration of Simon's Basic graphics, and take a look at the exploding number of hardware/software graphics packages for the C-64. See you then. ■

Listing 1.

```
1 REM LISTING 1
2 REM USING "FLASH"
3 REM
4 REM-----------------------------------
10 PRINT:PRINT:PRINT:PRINT
20 PRINT "■YOUR ATTENTION■, PLEASE."
30 FLASH 1, 50
```

Listing 2.

```
1 REM LISTING 2
2 REM USING "FLASH"
3 REM IN MULTIPLE COLORS
4 REM-----------------------------------
10 PRINT:PRINT:PRINT:PRINT
20 PRINT "                ■PLEASE!"
30 FLASH 7, 10:FLASH 2,10
40 PRINT "■DON'T■ TOUCH THAT DIAL."
```

Listing 3.

```
1 REM LISTING 3
2 REM THE "FILL" COMMAND
3 REM AN EASY EXAMPLE
4 REM-----------------------------------
10 FILL 5,3,15,17,65,4
```

Listing 4.

```
1 REM LISTING 4
2 REM THE "MOVE" COMMAND
3 REM AN EASY EXAMPLE
4 REM-----------------------------------
10 PRINT"■┌┐┌┐"
20 PRINT"└┼┼┼┘"
30 PRINT"└┼┼┼┘"
40 PRINT"└┘└┘"
50 MOVE 0,0,5,5,5,5
60 MOVE 5,5,5,5,10,10
70 MOVE 10,10,5,5,15,15
```

Listing 5.

```
1 REM LISTING 5
2 REM THE "MOVE" COMMAND
3 REM MOVING FOR ARTFUL EFFECT
4 REM-----------------------------------
10 PRINT"■■                    "
20 PRINT"■■                   "
30 PRINT"■■                   "
40 PRINT"■■                   "
50 PRINT"■■                   "
60 PRINT"■■                   "
70 PRINT"■■                   "
80 PRINT"■■                   "
90 PRINT"■■                   "
100 PRINT"■■                  "
110 PRINT"■■                  "
120 PRINT"■■                  "
130 MOVE 0,0,15,15,10,20
140 MOVE 0,0,5,5,7,7
150 MOVE 5,5,9,9,10,10
160 MOVE 10,10,5,5,0,0
```

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Abigail Reifsnyder

Microsoft Multiplan

Question of the month: Does anyone *really* like spreadsheets? I used to think spreadsheets were like running—no one *really* likes it, but you can get used to it if you keep at it and believe it's doing you some good. (People who say they *love* either running or spreadsheets should be watched very carefully.) But I've made a great discovery. Spreadsheets were designed to be used on machines like the Mac. (Was the Mac designed for spreadsheets?) The hi-res graphics, the mouse, the pull-down menus, the computing power—all these can work together to make even a spreadsheetophobe like me learn how useful (almost fun) a spreadsheet can be. The really good news is that Microsoft has actually taken advantage of these features in its Mac version of *Multiplan*.

The first thing you notice when you open *Multiplan* is how easy it is to read the screen, and when you are working with lots of tiny cells filled with numbers, how easy it is to read becomes vitally important. As for the mouse, this seems to be the most natural way to find your way around a spreadsheet. It gives you back the one advantage paper spreadsheets had over electronic spreadsheets. You can move around easily, selecting an individual cell or a group of cells.

As is the case with all the Mac software I have looked at so far, the pull-down menus make it almost unnecessary to read the manual (for which we should all be thankful—the *Multiplan* manual is pretty boring), since all the commands are right there for the pulling.

So, how does it actually work? The screen is divided into three areas: the menu bar across the top, the formula bar, and the spreadsheet itself. To begin entering information, you select a cell or group of cells. When entering information into a group of cells, each cell becomes current in the order in which you selected it. Also, you can select adjacent cells using keyboard commands. In other words, you don't have to go back and forth constantly between the mouse and the keyboard when entering data.

The most useful features of the program when creating formulas are the Paste Function, the Define Name, and the Paste Name functions. The Define Name feature allows you to give names to several blocks of cells. Then, using the Paste Function feature, you can select the operation you want to perform on those blocks. Then you paste into the formula the names of the blocks of cells.

If you create a formula that is too big for the cell, you simply enlarge the cell by clicking the mouse on the edge of the column and dragging it out. Similarly, if you want to see different parts of the worksheet simultaneously, you click on the Split bars (at the end of the scroll bars) and drag to create panes in the window.

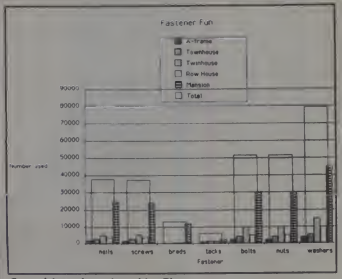
Another useful feature of Macintosh *Multiplan* is the ability to protect a worksheet, then "unprotect" individual cells. This allows you to protect all your formulas, for example, while allowing certain data to be changed. (By the way, if you are changing many numbers in a large and complex spreadsheet, you will want to put it on manual calculation so it doesn't try to recalculate each time you enter a new number.)

Linking and interfacing are the two other magic words that come up when talking about *Multiplan*. As with the PC version of *Multiplan*, you can link worksheets. Even better you can interface *Multiplan* with Microsoft's *Chart* program, taking the data from your spreadsheet to create series to be plotted in *Chart*. And, if you want, you can link

Tool Needs of the Lunatic Construction Company

	A-frame	Townhouse	Twinhouse	Row house	Mansion	Totals
nails	2,000	2,560	5,079	3,345	25,000	37,984
screws	1,534	2,700	5,400	3,597	24,099	37,330
brads	12	150	500	312	12,000	12,974
tacks	200	1,029	1,400	1,145	2,500	6,274
bolts	2,176	4,300	10,000	5,034	30,000	51,510
nuts	2,178	4,299	10,000	5,055	30,050	51,582
washers	4,000	5,400	15,000	10,000	45,000	79,400
Totals	12,100	20,436	47,379	28,488	168,649	277,054

Sample Multiplan spreadsheet.



Spreadsheet data plotted by Chart.

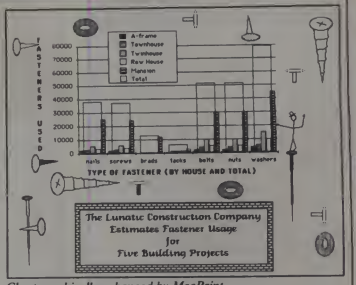


Chart graphically enhanced by MacPaint.

the chart to the worksheet, using the *Chart* Paste and Link function.

Plotting Along

Which brings us to *Chart*. *Chart* is another application that seems perfectly suited to the Macintosh. The hi-res graphics make for charts and graphs as sharp as you'll ever see in a newspaper or magazine. And while it isn't necessary to use it with *Multiplan*, the ease with which the two interface makes them a terrific duo.

The *Chart* screen is divided into three areas: the menu bar, the display window (where the charts are drawn) and the series window (actually, there are as many series windows as there are series of data). Data can be entered from the keyboard or pulled in from *Multiplan*. (Important note: don't try to Paste and Link a worksheet from *Multiplan* and a chart unless you have two drives. If you do, you'll go nuts switching disks back and forth.)

Chart allows you to manipulate the data in several ways once it is entered. First, you can sort a series by category or value, in ascending or descending order. More important, though, you can use the Analyze feature to calculate the average, cumulative sum, difference, percent, trend or other statistics of the series data. The Analyze feature creates a new series using the new data.

Before you actually plot a series, you should select the type of chart you want by pulling down the Gallery menu. The options are bar, column, pie, scatter, line, area, and combination, and within each type of chart, there are several styles. (The combination chart allows you to combine a column chart with a line chart—especially convenient when you are plotting an average or trend over the actual data.) You may also overlay a second chart on the main chart. When you do this, you may make the two charts of any type or style. (Of course, not all charts work right together. I tried to overlay a line chart on a bar chart—bad idea. The bar chart reversed the x and y axes, but my overlay line chart was still using the original axes, leaving me with a meaningless, though pretty, chart.)

Once you have plotted a chart, you can do all kinds of fun things to it, adding arrows and legends, changing patterns, and so on. (Each time you make even the smallest change, though, the entire chart is redrawn.) While *Chart* does make pretty nice charts, you can make your charts look even better by copying and pasting them into MacPaint. There you can change typefaces and styles, add little pictures, or do whatever your little heart desires.

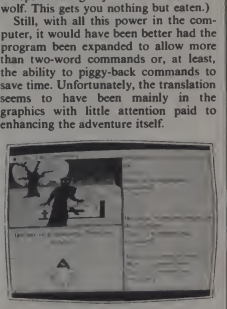
While neither *Multiplan* nor *Chart* is for the casual user (the price tags make that clear), for someone who is going to do a lot of number analyzing and graphing, the two programs together make a spiffy package. And the two used in conjunction with MacPaint is even better.

Transylvania

Opinion seems pretty well split on whether or not the Macintosh is good for game playing. The first test: *Transylvania* from Penguin Software. This combination text and graphics adventure divides the screen into three sections (three seems to be a magic number for the Mac): the graphics area (where you see where you are), the text portion (where you are told what is going on and give commands), and a compass (where you can use the mouse to click north, south, east, or west). While it at first seems cute to use the mouse, it is, in fact, a waste of space (both on the screen and in the program). Since you have to use the keyboard for all other commands, there is not much point in using the mouse at all.

That aside, this version of *Transylvania* is pretty good. The graphics are sharp, and it is not too easy. The object of the adventure is to find "a damsel in distress" who has been kidnapped and hidden somewhere in a forest infested with bats, werewolves, vampires, etc. You wander around the forest collecting such goodies as garlic as you search for the damsel. If you don't remember your supernatural lore well, you will have a tough time of it. (It isn't my specialty, so I kept showing my cross to the werewolf. This gets you nothing but eaten.)

Still, with all this power in the computer, it would have been better had the program been expanded to allow more than two-word commands or, at least, the ability to piggy-back commands to save time. Unfortunately, the translation seems to have been mainly in the graphics with little attention paid to enhancing the adventure itself.



Transylvania player meets werewolf.

Fact and Fiction Toolkit

Can an Apple computer be complete without mention of the IIc? While software for the regular IIs runs on the IIc, there is very little so far that has been designed specifically for the IIc. *Fact and Fiction Toolkit* from Scholastic is one of the first programs to take full advantage of the hi-res graphics of the IIc. The package consists of two separate programs: Secret Filer, a filing system taken from *Microzine*, and Story Maker, a story writing and illustrating program.

Story Maker has a menu of icons (a typewriter, a picture, a pencil and an eraser) along the bottom of the screen to help a child make up a story. Using the mouse, you choose the typewriter to write your story. Text may be placed anywhere on the screen since it is really just another graphic. The picture icon takes you to the picture gallery where you can choose one of several predrawn shapes and objects. The pencil allows you to draw freehand (you choose the width and color of the line), while the eraser allows you to erase anything on the screen. An open book icon allows you to turn pages, and the exit sign takes you out of the program.

Story Maker is lots of fun to play with

Fact and Fiction Toolkit uses hi-res graphics of IIe and a menu of icons.

because it has just enough structure to help a child create a story without actually forcing him into specific patterns or ways of thinking. The child can move back and forth between pictures and text so that as more ideas come to him, he can use them right away. The picture gallery contains a variety of objects that act as a springboard for your own ideas. If you select a picture from the gallery, you can flip it, change its size, and stamp it repeatedly over the screen.

One of the best features of the program is that not only is the program itself simple to use, but the instructions for booting a disk, saving a story and so on are also straightforward, so that a child playing with the program would need only minimal, if any, supervision.

Secret Filer is a simple filing program that allows you to keep lists of names and addresses and similar types of information on electronic 3x5 cards. You can then sort the cards according to any file heading used when entering them. Similarly, you can search through the cards using a key word. This is no sophisticated database, but it is all most eight-year-olds are likely to need or use.

Firms Mentioned in This Column

Microsoft
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(206) 828-8088

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Assembly Language Tutorial

Outpost: Atari

David and Sandy Small

Welcome to the Outpost. This month and next our columns are aimed especially at those who want to explore the capabilities of the Atari and learn a little about the machine. There isn't any difficult machine language to work with, no long programs to type in, or anything else complex—just a lot of fun creating effects on the machine.

For you budding programmers, all this has a point, too. After we are done playing with the machine, we will explain why some of these effects occur and next month we will begin to delve into the mysterious, confusing world of assembly language.

An assembly language tutorial has been on our minds for some time. However, we must credit the Randolph Area (Randolph Air Force Base, San Antonio, TX) User's Group with motivating us into finally doing this tutorial. We visited there in April, and asked what they would like to see in a column; the item most wanted was an assembly language tutorial.

Okay, fold the page of *Creative* back so you have its undivided attention, and position the lights so they don't glare on the page. Plug in your Basic cartridge, and turn on your Atari; the disk doesn't really matter. As soon as you see the READY prompt at the top of the screen, type:

POKE 755,4 (and press RETURN)

How about that. Every character on the screen, including the READY and the line you typed, has flipped upside down. (This is a great trick to play at a computer store; go in, type in the POKE, and clear the screen. The next person to play with the Atari is in for a big surprise.)

Okay, let's flip them back:

POKE 755,2

Or how about flipping them back and forth with a program?

```
10 FOR A=1 to 10000
20 POKE 755,2
30 POKE 755,4
40 NEXT A
```

This effect is particularly hard on the eyes; half the time, the characters are rightside up, and the rest of the time, they are upside down. If you want to slow this down, add:

```
25 FOR DELAY=1 TO 500:NEXT
   DELAY
35 FOR DELAY=1 TO 500:NEXT
   DELAY
```

This causes a delay between flips.

Here is a nice little surprise. POKE 709,0 and all the characters on the screen turned black, didn't they? If you POKE 709,15, they will turn whiter-than-white—much brighter than you are used to. What about getting rid of the standard blue color you edit with? POKE 710,0, and the background color will go black. You now have a very intense black and white screen. Should you find this to be too much for your eyes, you might like to try the green and white screen I use: POKE 709,12 and POKE 710, (12*16)+4.

In fact, you can POKE any number from 0 to 255 into 709, and it will vary the intensity of the characters on the screen. As you POKE any value from 0 to 255 into 710 the color of the background varies.

Let's try two more loops, which rapidly stuff different values into 709 and 710, with corresponding wild effects on color:

```
10 FOR A=0 to 15
20 POKE 709,A
30 NEXT A
40 GOTO 10
```

or

```
10 FOR A=0 to 255
20 POKE 710,A
30 NEXT A
40 GOTO 10
```

(When you get tired of this display, just press SYSTEM RESET or BREAK to stop it.)

Then, of course, we can vary them both:

```
10 FOR A=0 to 255
20 POKE 710,A
30 POKE 709,225-A
40 NEXT A
50 GOTO 10
```

If the displayed characters don't take up a full TV screen in size, there is a border around them. The color for this border can also be set:

```
10 FOR A=1 to 255
20 POKE 712,A
30 NEXT A
40 GOTO 10
```

Feel free, of course, to experiment with these effects. After you have typed in these short programs, try modifying them and playing with them. Perhaps you could use an INPUT statement to input a value to POKE into 709, or you could put random numbers into 709 (something like POKE 709,INT(RND(0)*255)). There are all sorts of possibilities, and remember the law of Atari:

"If you are just playing around and create a wild display on the Atari, you are probably the first person ever to see that display." That is an exciting thought for me.

Let's consider what we have done. With some POKE statements, we have

flipped characters upside down, modified colors, and even flashed them wildly.

What exactly is this POKE statement, anyway? It seems to have some pretty powerful capabilities.

POKE takes a number and stores it at a specific location inside the Atari. How does this work? Well, there are 64,000-odd locations inside the Atari; that is why it is called a 64K machine. The Commodore 64 is also a 64K machine; that is how it got the name. Each of these 64,000 separate locations is identified by a number: location 710, for instance, or location 21250. Each of these locations can hold any number from 0 to 255, inclusive. (No fractions allowed, by the way). See Figure 1.

We can read the number from 0 to 255 from any of those locations or write a number with the same restrictions. For instance, let's look at location 1536. Type PRINT PEEK(1536) and you will get back a number, probably a zero. That is what is in location 1536 at this instant.

Let's go ahead and change it. Type POKE 1536,200, then PRINT PEEK(1536). When you read that location again, you will find the 200 you POKEd in there. See Figure 2.

Bear in mind that you cannot POKE a number greater than 255 into a location. Go ahead and try it if you like: POKE 1536,1000, and you will get an error message.

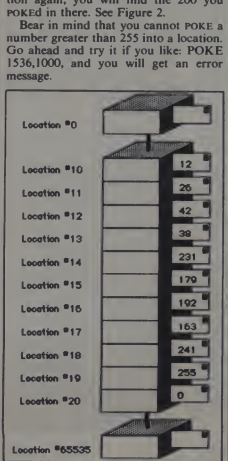

Figure 1.

Why? There is a good reason having to do with bits and bytes and the nature of computers, but an analogy is the best example. Think of a football scoreboard with two digits. It can display a score from 00 to 99, right? If a team scores more than a hundred points, the scoreboard just cannot keep up. Computer memory does not store individual digits, like a 0 or a 7; it stores numbers in a different way. However, there are restrictions on this new way, also, and the restrictions happen to limit us to three digits and to 255 as the highest possible number.

If you can think of memory as 64,000 mailboxes, each numbered, then what we just did was to change the 0 that was in mailbox #1536 to a 200. You can change the contents of any mailbox to any value from 0 to 255; for instance, all we did with our wild color loops was to modify locations 709 and 710.

Now the contents of certain memory locations are used by the Atari to determine color and intensity of the screen, whether or not characters show right side up or upside down, and so on. You have to know the memory location and you have to know the right number to POKE in there, and if you do, you can control these functions.

You may have used the SETCOLOR command, which changes the color on the screen in much the same way we have just changed it. Well, all that SETCOLOR is is a fancy POKE to locations 709-712; you can duplicate SETCOLOR with a POKE. All that the SOUND commands do is POKE into memory locations that control sound, and so forth.

In fact, *everything* on the Atari is controlled via memory locations. Just read or write to them, and you have awesome power over the machine. All of the great games you have seen work by POKEing into special memory locations. And the games get data from the user by PEEKing memory locations. For instance, want to see how the joysticks work? Okay;

```
10 PRINT PEEK(54016)
20 GOTO 10
```

You will get a rapidly printing list of numbers, all the same. Now plug a joystick into port 1 and press it in different directions; the numbers change consistently. A particular joystick press always results in the same number.

In other words, the way a game reads the joystick to find out how you have pressed it is just by examining (PEEKing) location 54016. That's right: *Star Raiders* works by looking at 54016 to see what course you choose to follow through the stars, and *Pac-Man* looks to the same place to determine your path around the maze. Pretty amazing memory location, isn't it?

The joystick button shows up at location 53264. Try:

```
10 PRINT PEEK(53264)
20 GOTO 10
```

and you will see what I mean. You will read a 1 until you press the joystick button; at which time, the value will change to a 0.

You will notice that you always read numbers between 0 and 255 from the joystick and button locations. Here is an interesting idea, since we are having fun: let's let the joystick output value (0-255) set the color on the TV screen:

```
10 VALUE=PEEK(54016)
(get joystick value)
20 POKE 710,VALUE
30 GOTO 10
```

Now try pressing the joystick in different directions. The effect ought to be a lot of fun. You can embellish this in all sorts of ways.

Now, true, Atari Basic gives you the STICK command to check to see how the joystick is pressed. But all the STICK does is PEEK (54016) and manipulate the value it receives so it is a little easier for Basic programmers to use.

Before leaving you for this month, let me repeat an earlier statement, suitable for framing:

Next month, we continue with screen memory and the promised specifics of assembly language. ■

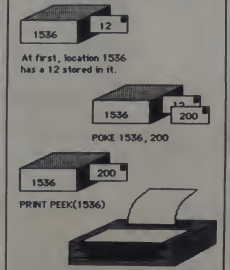

Figure 2.

Building a Better Basic

IBM Images

Susan Glinert-Cole

Build a better mousetrap and the world will beat a path to your door. This sterling example of marketing maxims does not take into account the fact that the definition of "better," like many relational descriptors, depends upon which side of the mousetrap you happen to be sitting on. I admit to having been a victim of mousetrap relativity myself quite recently.

Needing some rodent deterrent more effective than two indifferent cats, I spent an interesting hour in the pest eradication section of my local lumber/hardware/furniture supermarket. The shelves positively dripped with the fruits of legions of mousetrap designers, ranging in style from the humble spring-loader (bring your own bait), to a homey mouse-house furnished with a package of tasty, but lethal, victuals.

In a sudden fit of orginality, probably brought on by the overenthusiastic literature emblazoning the side of the package, I selected a trap best described as a little pan of extremely sticky glue. The entire installation (so the documentation said) consisted of placing the pans wherever the telltale signs of rodent infestation have been appearing and wait for the little critters to cruise into the stuff. Forthwith, they will be stuck fast, and can thus be disposed of, pan and all, without fuss, muss, or bother. Unfortunately, the documentation omitted to mention that mice don't much care for stepping in pans of superglue; they merely waltz around them on the way to the rubber spatula. Thus, these mousetraps confirm the "better mousetrap" theory: they are infinitely better from the mouse's point of view.

Now, if we substitute Basic for mousetrap, we can instantly transport the discussion into the realm of computer science. Several third-party Basics have appeared on the market in the last year. Are they better than the version that comes along with every PC, and if so, for whom?

The IBM PC comes standard with an excellent Basic interpreter and editor in ROM. Disk Basic and advanced Basic provide powerful enhancements to the plain vanilla version and are included with the purchase of PC-DOS. Given the price/performance ratio of the PC's interpreted Basic, one could well ask what could persuade a user to purchase a third-party Basic.

Given the price performance ratio of the PC's interpreted Basic, what could persuade a user to purchase a third-party Basic?

Let's start by considering what features in PC-Basic are weak or absent, and what a third-party Basic might therefore include to mitigate the price differential. For the sake of simplicity, I have broken down the components of Basic into three categories: the editor, the interpreter/compiler, and the debugging environment.

The Editor

PC-Basic has what is known in the industry as a full-screen editor. This means that you can edit anywhere on the screen, in no particular order, by simply moving the cursor around, entering a change, and pressing RETURN. By way of contrast, a line editor allows you to make changes only on a particular line; up and down cursor movements are forbidden or futile. A notorious example of line editors for the PC is EDLIN, a "freebie" supplied with PC-DOS and best left to curdle its code on the DOS master disk. Full-screen editors are preferred for program entry, and the PC-Basic editor is an excellent one.

In the case of interpreted Basic, you must have an interactive editing/execution environment. This is not, however, the case with compiled Basic. In general, compilers do not come with integrated editors, and the manner in which you coax the program into a form the compiler can deal with is left entirely up to your good judgment.

The Interpreter/Compiler

Like all fine tools, these programs should be easy to use, but have enough flexibility for advanced programming. Ideally, they should be bug-free; realistically, any bugs should be minor and infrequently encountered annoyances which are slapped, in a timely fashion, with a software patch provided free by the supplier. The code produced should be efficient and compact.

Nice touches include meaningful error messages, a wide range of extensions, and impeccable documentation. Another desirable feature is dynamic syntax checking, where a program line is checked for syntax errors when it is en-

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tered, not when it is executed. (This is a standard feature with Hewlett-Packard Basics.)

The Debugging Environment

This is one area in which PC-Basic falls flat on its nose. The only integrated debugging tool is the TRON command. In general, I haven't found the output from this command informative. Several companies provide utilities for tracing a Basic program and printing a cross-reference listing. This is not only an extra expense, but requires you to work outside of the program development environment. All other things being equal, a compiler/interpreter with good debugging tools has a philosophical price above rubies.

The length constraints of this column make it impossible to give you a good feel for each of five different Basics in a single month. Because each product represents a prodigious amount of work on the part of the software developers, I have decided to examine each Basic individually over the next several months. When they have all been reviewed, I will try to assemble a table summarizing the important features of each.

Professional Basic

This Basic, written by Dr. Neil Bennett, is a product of Morgan Microcomputing. Two other Morgan offerings with which I am familiar are *Trace-86* (an assembly language debugging system), and a program editor called *TED*. My impressions of the company are mixed. They set their sights very high, attempting to include intricate and complex facilities in their products. This naturally represents an enormous investment in development time, but their prices are not unreasonable. On the down side, the implementations are occasionally unpredictable and require some patience for a user to acquire a good comfort level.

Of the three Morgan products, Professional Basic is by far the best. The product is a pleasure to use; it did nothing peculiar during my trial runs. The single anomaly noticed happened after I left the Professional Basic environment: my word processor acted weird, and the system required a reboot to bring it back to normal. Professional Basic incorporates features that will elicit constant mumbles of delight from the most jaded Basic programmer: dynamic syntax checking, more than 15 different flavors of debugging windows, and line labels.

The program reviewed here (version 1.0) requires a hefty investment in hardware: at least 256K of RAM (320K is recommended), an 8087 coprocessor, and a monochrome or non-IBM color graphics adapter. (Running Professional Basic with the IBM color adapter generates more snow than August in Antarctica). The next release, promised for the late summer, will not require the 8087 and promises snowless display screens with the IBM color graphics board.

Professional Basic can use all the available memory in your computer. Because array subscripts are 32-bit integers, you can have arrays with up to two billion elements. The maximum number of dimensions is limited only by the 320-character length of a Basic program line. These limits would probably satisfy all but the most dedicated databaser. A trivial, but classy, addition is the elimination of those pestiferous quote marks around file names.

Documentation

The weakest part of Professional Basic is the documentation. It is professionally typeset and comes in a handsome half-sized ring binder, but is written in kind of a stream-of-consciousness style. Specific points are hidden within paragraphs, and it is impossible to pick out information by skimming over the pages. A very careful perusal of the text will usually yield the answer to a question, but I encountered several problems whose solution could not be found in the text, table of contents, or index. The courteous and friendly folks at Morgan will answer any questions left dangling by the documentation, but this won't help the nocturnal/weekend programmer.

Professional Basic incorporates features that will elicit constant mumbles of delight from the most jaded Basic programmer.

The basic premise for this product is quite different from that usually found in language software. Most compilers and interpreters incorporate a series of laconic error messages on the order of "syntax error" or "divide overflow." They rarely include any provision for examining the program execution other than the brute force approach of sticking STOP statements on each line. The designer of Professional Basic assumes that people usually make mistakes while writing programs and ought to have informative error messages combined with superior, integrated debugging tools. Evaluated in terms of its debugging environment, Professional Basic is in a class by itself.

Dynamic Syntax Checking

Professional Basic incorporates a line editor with dynamic syntax checking. A press of the spacebar automatically generates a line number or you can type the number in if you wish instead. If you enter something on a line that the editor doesn't think should be there, it beeps at you and the cursor refuses to budge from the offending character. If you press RETURN twice, the set of keystrokes that are valid at that point is displayed. This approach is a vast improvement over picking lines of code apart in search of the vaporous "Syntax Error." The editor is easy to use; you can zip to the beginning or the end of the line and go from word to word. Deletions can be performed to the end or the beginning of a line, and groups of lines can be zapped at once. A line can be called for editing by typing:

EDIT line number

The line just edited can be recalled with F8; F9 moves back one line; and F10 displays the next line for correction. These three keys let you stroll through a file and edit any line that strikes your fancy.

Professional Basic allows the use of line labels within programs. This name, which can be of any length within the 320-character per line constraint, can be used as a reference in GOSUB and GOTO statements. Periods and underscores are allowed within the labels (see Listing 2, line 340).

Another cute feature is "lazy entry." Instead of typing a variable like SUPER.MEMORY.CLOBBER.ROUTINE over and over, all you have to do is type in enough of the word to identify it, followed by the @ character. If you haven't typed in enough characters to distinguish between several choices, you get a beep, and are invited to type a few more characters.

Professional Basic deals with programs created under another editor with remarkable cleverness. The program, which must be in ASCII format, is checked by Professional Basic during the loading process. When an error is found, a beep is generated, the offending line is changed to include an error message, and loading continues.

Search Facilities

Two helpful search facilities are incorporated into this editor. The first is the FIND command, which locates every reference to a label, variable, or line number. Typing the command:

FIND PRIME
scrolls the lines containing the variable PRIME, highlighted in reverse video, onto the display. Alternatively, the command:

FIND PRIME=
will locate all lines in which PRIME has been assigned a value. Pressing the spacebar presents one line at a time; pressing RETURN resumes full speed scrolling. The search can be abandoned by hitting ESC.

FIND can locate only variables and line labels. Searching for a group of characters is performed with the SEARCH command. SEARCH is particularly useful when you have imported a Basic file from another system that includes code incompatible with Professional Basic. The command:

SEARCH ~
finds all the lines marked by the dynamic syntax checker as containing errors.

Searching without sorting is something like mink without diamonds.

Searching without sorting is like mink without diamonds.

Never fear, Professional Basic has two different varieties of sort commands: SORTV and SORTL. The former will present an alphabetical listing of all the variables in the program while the latter scrolls all the line labels onto the display.

Running the Program

As we all know, typing in the program is a piece of cake compared to the next step: getting the thing to run correctly. In this opaque area of logic analysis Professional Basic really shines.

Listing 1 is the PC-Basic rendition of that unspellable paragon of benchmarks: the Sieve of Eratosthenes prime number generator. Listing 2 shows the same program, converted to Professional Basic. You will notice that Professional Basic, like the PC-Basic compiler, does not allow variables to be used in DIM statements.

Professional Basic creates the debugging environment through the use of windows. Each of the windows presents a different view of the code execution. The windows are invoked by pressing ALT plus some letter. In some cases, however, it is not necessary to prefix the letter with ALT, which can be a bit confusing.

Typing SRUN, for stop run, switches the display to the list trace window (Figure 1). The first statement is highlighted (seen as a horizontal bar when printed). Hitting RETURN causes the program to execute at full speed; the currently executing statement is highlighted in reverse video. Pressing the spacebar causes the system to go into the single step mode. At any time during execution, the windows can be opened and closed, and listed to the printer. Breakpoints can be placed anywhere in the program.

The list trace window has four separate formats, invoked by pressing numbers 1 through 4. Options 2 underlines

Listing 1.

```
' 
'                        Sieve of Eratosthenes
'                             PC-BASIC
'
  TIME$ = "0:0:0"
  DEFINT A-Z: MAXINT = 1000:PRIME = 2
  DIM X (MAXINT)
  FOR I = 1 TO MAXINT STEP 2
    X(I) = 1
  NEXT I
'
    PRINT PRIME;
'
  IF PRIME * PRIME > MAXINT THEN 180
    FOR I = PRIME * PRIME TO MAXINT STEP PRIME + PRIME
      X(I) = 0
    NEXT I
'
  FOR J = PRIME + 1 TO MAXINT
    IF X(J) > 0 THEN PRIME = J:GOTO 110
  NEXT J
  PRINT: PRINT "elapsed time = "TIME$
  END
```

Listing 2.

```
10 '                  Sieve of Eratosthenes
15 '                   Professional BASIC
20 '
30                    TIME$ = "0:0:0"
40                    DEFINT A-Z: PRIME = 2
50                    DIM X (1000)
60                    FOR I = 1 TO 1000 STEP 2
70                      X(I) = 1
80                    NEXT I
90 '
110 PRINT.NUMBER:     PRINT PRIME;
120 '
130                   IF PRIME * PRIME > 1000 THEN 180
140                     FOR I = PRIME * PRIME TO 1000 STEP PRIME + PRIME
150                       X(I) = 0
160                     NEXT I
170 '
180                   FOR J = PRIME + 1 TO 1000
190                     IF X(J) > 0 THEN PRIME = J:GOTO PRINT.NUMBER
220                   NEXT J
230                   PRINT : PRINT "elapsed time = "; TIME$
240 END.HERE:         GOTO 240
```

```
160          1093  000                x   s      I    step f i g 0   I   4 VP0
 10 '                  Sieve of Eratosthenes
 15 '                   Professional BASIC
 20 '
 30 TIME$ = "0:0:0"
 40 DEFINT A-Z
    PRIME = 2
 50 DIM X (1000)
 60 FOR I = 1 TO 1000 STEP 2
 70   X(I) = 1
 80   NEXT I
 90 '
110 PRINT.NUMBER;PRINT PRIME;
120 '
130 IF PRIME * PRIME > 1000 THEN
      180
140 FOR I = PRIME * PRIME TO 1000 STEP PRIME + PRIME
150   X(I) = 0
160==NEXT=I=============================================================
170 '
180 FOR J = PRIME + 1 TO 1000
190   IF X(J) > 0 THEN
        PRIME = J
        GOTO PRINT.NUMBER
220   NEXT J
```

Figure 1. List Trace Window. Plain Vanilla.

```
160          1093  000              x  s     1   step f l g 0  1  4 VP0
          1     10 '                  Sieve of Eratosthenes
          1     15 '                  Professional BASIC
          1     20 '
          1     30 TIME$ = "0:0:0"
          1     40 DEFINT A-Z
          1        PRIME = 2
          1     50 DIM X (1000)
          1     60 FOR I = 1 TO 1000 STEP 2
        500     70    X(I) = 1
        500     80    NEXT I
          1     90 '
          1    110 PRINT.NUMBER;PRINT PRIME;
          1    120 '
          1    130 IF PRIME * PRIME > 1000 THEN
          0           180
          1    140 FOR I = PRIME * PRIME TO 1000 STEP PRIME + PRIME
         40    150    X(I) = 0
=========40====160===NEXT=I=============================================
          0    170 '
          0    180 FOR J = PRIME + 1 TO 1000
          0    190    IF X(J) > 0 THEN
          0              PRIME = J
          0              GOTO PRINT.NUMBER
          0    220    NEXT J
```

Figure 2. List Trace Window. Instruction Count.

```
                                                          10 '                    Sieve \
                                                          15 '                     Profe\
                                                          20
                                                          30 TIME$ = "0:0:0"
                                                          40 DEFINT A-Z
                                                             PRIME = 2
                                                          50 DIM X (1000)
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx    60 FOR I = 1 TO 1000 STEP\
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx    70    X(I) = 1
                                                          80    NEXT I
                                                          90 '
                                                         110 PRINT.NUMBER;PRINT PRI\
                                                         120 '
                                                         130 IF PRIME * PRIME > 100\
                                                                180
                                                         140 FOR I = PRIME * PRIME \
=========================================xxxx=150===X(I)===0=====================
                                      xxxx  160    NEXT I
                                                         170 '
                                                         180 FOR J = PRIME + 1 TO 1\
                                                         190    IF X(J) > 0 THEN
                                                                   PRIME = J
                                                                   GOTO PRINT.NUMBER
                                                         220    NEXT J
                                                         230 PRINT
                                                             PRINT "elapsed time = \
                                                         240 END.HERE;GOTO 240
```

Figure 3. List Trace Window. Histogram Option.

```
  160          1093  000              x  s     1)v step f l g 0  1  4 VP0
   10 '                  Sieve of Eratost\                                 
   15 '                   Professional BA\          i%                 160
   20 '                                                                   
   30 TIME$ = "0:0:0"                               j%                   0
   40 DEFINT A-Z                                                         
      PRIME = 2                                     prime%               2
   50 DIM X (1000)                                                       
   60 FOR I = 1 TO 1000 STEP 2                              3 / 3        
   70    X(I) = 1                                                        
   80    NEXT I                                                          
   90 '                                                                  
  110 PRINT.NUMBER;PRINT PRIME;                                          
  120 '                                                                  
  130 IF PRIME * PRIME > 1000 THEN                                       
         180                                                             
  140 FOR I = PRIME * PRIME TO 1000 ST\                                  
  150    X(I) = 0                                                        
=160===NEXT=I=============================                             
  170 '                                                                  
  180 FOR J = PRIME + 1 TO 1000                                          
  190    IF X(J) > 0 THEN                                                
            PRIME = J                                                    
            GOTO PRINT.NUMBER                                            
  220    NEXT J                                                          
```

Figure 4. Split Screen. List Trace/Variable Trace.

(or highlights) all the program lines not yet executed. Option 3, shown in Figure 2, shows the number of times each program instruction has been executed. Option 4 (Figure 3) generates a histogram representing the relative frequency of instruction execution.

Some windows can be split. Figure 4 shows the list trace window sharing the limelight with the variable trace window. The total number and the current value of each variable in the program is displayed. The 3/3 says there are three variables in the program and that the third variable is displayed on the screen. If there are more variables in the program than can fit on one screen, the cursor keys can be used to scroll/page through the entire list. Similarly, the current contents of arrays can be examined with the array window (Figure 5).

Figure 6 shows the time trace window on the right side of the screen. This window displays a set of descriptors for each instruction as it is executed. This window has what is poetically described in the manual as "historical rewind." The descriptors are the program line itself, the sequence number of the instruction, a serial number representing the cumulative number of instructions executed so far, and the variable value and/or assignment, if applicable.

A FOR/NEXT window, shown in Figure 7, displays the active loops, with their current index values. A GOSUB window similarly presents a list of the active subroutines. The DATA window displays a DATA statement with the next element to be read highlighted in reverse video. A FILE INPUT/OUTPUT window displays information currently in the file buffer of each opened file. The data in the file buffer can be toggled between hex and ASCII representation. A memory window lets you look at any area of memory to see what is going on there. At any time during a frantic windowing session, you can view the output screen generated by the program.

A memory window lets you look at any area of memory to see what is going on there.

Professional Basic is "semi-compiled." This means that some statements are translated to machine code before they are executed. Semi-compilation falls between an interpreted environment, where program lines are converted as they are executed, and a compiled environment, where all translations are performed prior to execution. The Sieve took PC-Basic 13 seconds to complete. To compile the program, it was necessary to change the DIM and DEFINT statements; the resulting program took four seconds to run with single precision variables. Professional Basic ran it in eight seconds (32-bit integers). I wasn't impressed with the speed, especially given the required 8087 coprocessor.

```
 100        1093  000          x  s     1?s step f l g 0  !  4 VP0
  10  '                Sieve of Eratost\
  15  '                 Professional BA\      x%(0)              0
  20  '
  30  TIME$ = "0:0:0"                        x%(1)              1
  40  DEFINT A-Z
      PRIME = 2                              x%(2)              0
  50  DIM X (1000)
  60  FOR ! = 1 TO 1000 STEP 2               x%(3)              3
  70    X(! ) = !
  80    NEXT !                               x%(4)              0
  90  '
 110  PRINT.NUMBER;PRINT PRIME;              x%(5)              5
 120  '
 130  IF PRIME X PRIME > 1000 THEN           x%(6)              0
          180
 140  FOR ! = PRIME X PRIME TO 1000 ST\      x%(7)              7
 150    X(! ) = 0                            x%(8)              0
--160--=NEXT=!=========================
 170  '
 180  FOR J = PRIME + 1 TO 1000              x%(9)              9
 190    IF X(J) > 0 THEN
          PRIME = J
          GOTO PRINT.NUMBER                          10 /  1001  (more ...)
 220    NEXT J
```

Figure 5. Split Screen. List Trace/Array Trace.

```
 160        1093  000          x  s     1?t step f l g 0  !  4 VP0
  10  '                Sieve of Eratost\      1%  140
  15  '                 Professional BA\ 1082  150 X(! ) = 0
  20  '                                        x%(140)    0
  30  TIME$ = "0:0:0"                  1083  160 NEXT !
  40  DEFINT A-Z                             1%  144
      PRIME = 2                        1084  150 X(! ) = 0
  50  DIM X (1000)                           x%(144)    0
  60  FOR ! = 1 TO 1000 STEP 2         1085  160 NEXT !
  70    X(! ) = !                            1%  148
  80    NEXT !                         1086  150 X(! ) = 0
  90  '                                      x%(148)    0
 110  PRINT.NUMBER;PRINT PRIME;        1087  160 NEXT !
 120  '                                      1%  152
 130  IF PRIME X PRIME > 1000 THEN     1088  150 X(! ) = 0
          180                                x%(152)    0
 140  FOR ! = PRIME X PRIME TO 1000 ST\ 1089  160 NEXT !
 150    X(! ) = 0                            1%  156
--160--=NEXT=!=========================1090  150 X(! ) = 0
 170  '                                      x%(156)    0
 180  FOR J = PRIME + 1 TO 1000        1091  160 NEXT !
 190    IF X(J) > 0 THEN                     1%  160
          PRIME = J                      1092  150 X(! ) = 0
          GOTO PRINT.NUMBER                      x%(160)    0
 220    NEXT J                    ========1093==160=NEXT=!==========
```

Figure 6. Split Screen. List Trace/Time Trace.

```
 150        1092  000          x  s     f  step f l g 0  !  4 VP!
-------------------------------------------------------------------
  140 FOR ! = PRIME X PRIME TO 1000 STEP PRIME + PRIME
  160 NEXT !
first      4                        last       1000
step       4                        index      160
```

Figure 7. For/Next Window.

The version of Professional Basic I worked with did not implement any of the rich graphics or sound functions and statements available in IBM Basics. Neither is there there any provision for interfacing with assembly language: CALL, BLOAD, VARPTR, and the like are absent from the legal list commands. I am promised that the next version will have these features incorporated.

A more serious problem, from a software development point of view, is the lack of a Basic compiler, and the resulting inability to run programs outside of the Professional Basic environment. While a programmer could develop a program in this system and then compile it elsewhere, the Professional Basic enhancements, such as line labels, would have to be eliminated. Professional Basic, at least at this juncture, appeals to two audiences: the person who wants to learn Basic programming and the software developer who doesn't need sound, graphics, or an assembly language interface. As a teaching tool, it is unquestionably outstanding and would be a tremendous asset to the computer neophyte. Given some enchancements, and I expect that Morgan will oblige, it could develop into a superlative development system. ■

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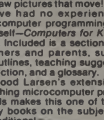

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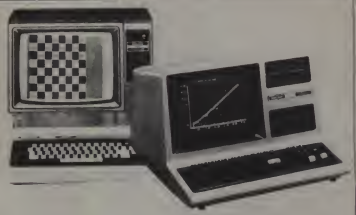

TRS-80 Strings

Stephen B. Gray

Tuning to channel 66 on our Tandy receiver, we see two books designed to help *VisiCalc* users, the Color Computer Deluxe Joystick, the *CoCo Cookbook* program from Computerware, and another short program for generating non-repeating random number series.

Help With VisiCalc

Among the dozens of books I receive for review, three basic titles seem to predominate: How to Select a Personal Computer, How to Use the IBM PC, and How to Use Spreadsheet Software. Several of the spreadsheet books include or offer optionally a disk of worksheets. Let's look at two of these books for the TRS-80.

VisiCalc for the TRS-80 Model I and Model III Computers, by Edouard J. Desautels, is $16.95 from Wm. C. Brown Co. Publishers. An optional disk for the Model III only is $39.95 (no charge for shipping and handling if payment accompanies the order, otherwise $1 for the book, $2 for the disk).

Desautels wastes no time: by page three, he gives an example of the "difference between solving a problem using *VisiCalc* versus solving a problem using the conventional computer approach." The example (Table 1) involves projected income from book royalties and shows how relatively simple it is with *VisiCalc* to change a figure and get a new total, compared with an awkward computer program.

The next chapter gets down to the nuts and bolts of exactly how to use a Model I or III, with enough helpful illustrations and step-by-step procedures to make it easy for an absolute novice to get his TRS-80 up and running.

The chapter on Using *VisiCalc:* Some Preliminaries is very informative, showing exactly what's what and what's where in simple language. Chapter 4 shows how to set up the royalty problem and estimate the value of an IRA.

Chapters 5 through 10 involve functions, oversize worksheets, graphic output, trigonometry, formats, and disk files. Chapter 11 provides five case studies: expense log, portfolio evaluation, computing your net worth, sales projection, and interest computations.

Chapter 12, When to Avoid *VisiCalc*, discusses some of the program's limitations, as well as the problem of how you can "get carried away and become so infatuated with this tool that you find yourself creating work rather than reducing it because you are using a good tool for the wrong job." The last chapter summarizes *VisiCalc* commands for fast reference.

Appendix A, Using the Optional Disk, emphasizes that the disk "can only be used with a TRS-80 Model III that has two or more disk drives. It cannot be used in drive 0," which is for the TRSDOS disk. That is, unless you get a friend or Radio Shack store to copy the worksheets from the optional disk onto a minimum system disk you can use in drive 0. The optional disk does not contain *VisiCalc;* it is to be used with your *VisiCalc* program.

The optional disk contains all 16 of the worksheets of general use from IRA to interest calculations. The last paragraph in the book is refreshingly candid: "The optional disk may be helpful for those of you who can't spare the time to do any unavoidable typing, or those of you who will do anything to avoid typ-

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Table 1.

	A	B	C	D
1	A 1	B 1	C 1	D 1
2	A 2	B 2	C 2	D 2
3	A 3	B 3	C 3	D 3
. . .	. . .	. . .	. . .	. . .
. . .	. . .	. . .	. . .	. . .

Table 2.

ing. Happy computing!"

The entire book is written about as simply as possible and can be recommended to anyone with a Model I or III who wants an easy introduction to *VisiCalc*. The book is also available in an edition for the TRS-80 Model II and 16 for $16.95, with a disk of worksheets for $39.95.

An Introduction to VisiCalc Spreadsheeting for the TRS-80 Model II and Model 16 by Harry Anbarlian, a Byte Book from McGraw-Hill Book Co., is $49.95, and is accompanied by an 8" disk containing "all the reusable matrixes described in the book." Aubarlian's matrix is Desautel's worksheet.

Anbarlian's book is written in three sections: an introduction to *VisiCalc* spreadsheet matrixing; *VisiCalc* matrixing for the TRS-80 Models II and 16; and "how to create polished matrixes." Although the writing is simple and very easy to understand, the Desautels book is a little easier to follow at the beginning, since it begins with a brief example that doesn't get into the mechanics of *VisiCalc*, but shows only the results.

Anbarlian starts right off with the "boxes on the *VisiCalc* blackboard," a more technical approach (Table 2). Although the Desautels book can be understood without ever looking at the *VisiCalc* manual, Anbarlian's "is for those of you who perhaps have to read the *VisiCalc* manual but do not initially have the time to digest and use all the many and varied outstanding features of *VisiCalc*."

Not until Section II does Anbarlian give an example of using *VisiCalc*, creating step-by-step a Petty Cash Voucher matrix. So that an absolute beginner can see exactly what to do, every single step is given in charts, one for creating the blank voucher, another for inputting data, followed by an illustration of the completed matrix.

This step-by-step method is followed for every matrix in the book, which includes six "simple" ones (petty-cash voucher, inventory cost, price/earnings ratio, organizational chart, credit-card record, appointment calendar), seven "moderately complex" matrixes (construction-trades EEO, Treasury-bill investment yield, payroll, student's budget, IRA analysis, travel-expense voucher, education/selection impact ratio), and seven "complex" matrixes (bar graph, cost/sales comparative bar graph, 3-D bar graph, electric bill, zero-base budget, stock portfolio, departmental age analysis).

Each of these 20 sections on creating a matrix includes only the minimum information: the step-by-step charts and an example of using the matrix prefaced by a brief statement of the purpose of the matrix, and Doing it By Hand, showing how much more time and trouble is involved in doing the job manually.

On the other hand, Desautels includes a great deal of information with each case study showing how each worksheet is developed and going into much detail. Portfolio Evaluation takes nine 8 by 11" pages; Anbarlian's Stock Portfolio Matrix takes seven 6 by 9" pages.

Anbarlian's last chapter consists of 14 pages on How to Create Polished Matrixes, which involves Inserting Lines/Spaces; Matrixes With Titles, Names and Dates; Creating the Title Matrix; Consolidating Existing Matrixes; and Printing Matrixes.

The disk, intended to be used in conjunction with a *VisiCalc* disk, includes blank matrixes for all 20 examples in the book. This book, with the same matrixes, is available in editions for the TRS-80 Color Computer ($39.95 with matrixes on cassette; $23.95 without), and the TRS-80 Model III ($49.95 with matrixes on disk).

If you just want to run *VisiCalc*—with a minimum of explanation and without details—get the Anbarlian book, which does a fine job of presenting the essentials without embroidery. But if you want to know more about *VisiCalc*, to look behind the basic principles, and to understand what is going on, the Desautels book may be more to your liking.

Deluxe Joystick

For many Color Computer users, the standard joysticks at $24.95 a pair are adequate for most applications. But for those who prefer a Porsche to a Chevy, Radio Shack's Deluxe Joystick is the only way to go, even at a price of $39.95.

The standard joystick has only two user-operated components: the control stick and a fire button. The Deluxe Joystick has both and four more.

Radio Shack's Deluxe Joystick can be operated in either self-centering or free-floating mode and has trim controls for fine-tuning the position of the cursor.

Below and to the left of the Deluxe control stick are X-axis and Y-axis switches for making fine adjustments to the electrical center of the joystick. Before using the joystick, you move these "trim" controls to adjust the horizontal and vertical position of the cursor as close as possible to the center of the screen.

The Deluxe Joystick has two operating modes controlled by lever switches underneath the box. When you first connect this joystick, it's in spring center return mode (also called "self-centering"),

The Deluxe Joystick is for those who prefer a Porsche to a Chevy.

meaning that the control stick automatically returns to center position when you release it.

You can make the stick "free-floating" for either the X or Y axis or for both by flipping the levers on the bottom of the box. Free floating mode means that when you release the stick, it remains in whatever position it was in when you let go.

Controls aside, the main difference between the two joysticks is the shape of the plastic "surround" in which the control stick is centered. It's round in the standard joystick, so if you're playing *Doubleback*, for instance, you can just swing the control stick around, at its maximum extent to create a circle for capturing objects on the screen.

The surround on the Deluxe Joystick is square, so if you run the control stick around the edge of the surround, you'll create a square trace on the screen. This is a problem only if you're used to the circular surround of the standard joystick. If you're not, you'll find the Deluxe Joystick easy to use, and the extra controls let you make adjustments suited to the particular game you're playing or the graphics with which you're working.

The firing button on the standard Color Computer joystick is at the rear of the control box; on the Deluxe model, it's at the top left, which takes a little getting used to if you're accustomed to squeezing the button on the standard model.

The Deluxe stick isn't any more responsive than the standard stick, so unless the trim controls and dual operating modes are important to you for precision work in games and graphics software, you're just as well off with the standard joysticks, which cost less than a third as much as the Deluxe Joysticks.

CoCo Cookbook

For 32K Color Computers with at least one disk drive, Computerware offers the *CoCo Cookbook* program, which stores and retrieves up to 269 recipes per disk. Up to 3040 characters per recipe can be stored. Each recipe can be accessed by title, number, or special keyword.

Because the *CoCo Cookbook* is a free-form database manager (optimized for storing recipe-type information), it can be used to store any type of text, such as notes for a research paper.

The main menu has seven options: add, change, delete or find a recipe; change a title; list all recipes; end the program.

The title can be up to 45 characters long and should be as descriptive as possible. The title:

```
CHOCOLATE SOUFFLE,
COLD DESSERT
```

allows you to search for either chocolate or cold dessert.

The recipe can be entered in any form desired, with the list of ingredients first or last. If the recipe is longer than 3040 characters, it can be continued by making the last line:

```
CONTINUED IN RECIPE XXX
```

and using the Add new recipe option.

When changing recipes, a variety of edit commands is available, similar to the line editing functions of Extended Basic to permit changing, deleting, or inserting characters; spacing through the text; etc.

The nine-page manual includes Notes for Advanced Users which describe in some detail the four files on the disk. An appendix lists the 252 keywords (from AVOCADO to WORCESTER) embedded in the machine language part of the program. Before a new recipe is written to disk, these keywords are encoded in one or two characters; this compression reduces the amount of storage space required and permits storing more recipes than otherwise.

Frankly, using a computer to store recipes is too much like using it as a file drawer; the only advantage is that searching is made much easier. But is this worth all the time and effort required to put hundreds of recipes onto a disk? Why not just file the recipes by type?

What makes this recipe program different from the rest is that it can be used as a general purpose database manager, for storing almost anything that fits into the constraints of the recipe file format. On that basis, you might find it useful.

Short Program 20
Random-Number Series 2

From Welland, Ontario, Canada, H.C. Currie writes, "In the December 1983 issue (p. 353), you presented an interesting program by Frederick P. Burggraf which allowed Basic programmers to generate a series of non-repeating random numbers within a given range. This method involved building the numbers into a string variable, deleting the numbers from the string as they were randomly selected, and storing them in an array.

"This approach has several limitations:

(1) The program will not handle sequences of numbers in excess of 99, as 100 or more three-digit numbers, when placed in a string variable, will exceed the maximum length for string variables (255 bytes).

(2) Two areas must be set aside to hold the number sequence: the string variable holds the input; the array holds the output randomized sequence. It would be more desirable to be able to call this routine with the number sequence stored in an array and to return from the call with the random sequence in the same array. Also, by eliminating the string variable, the memory required can be substantially reduced.

(3) The calculations and data manipulation are more complicated than required to solve the problem.

"Attached is a listing of a routine I developed to generate non-repeating random numbers, which has been used successfully in several programs involving chance factors.

"The concept of the program is very simple. After loading the numbers into an array, entries from the array are selected by randomly generating an index or pointer. As each array entry is selected, it is placed in the bottom portion of the array, working from the bottom to the top. Any entry which this move displaces is placed in the upper portion of the array in the old location of the randomly selected entry.

"In effect, the two entries trade places. Thus, at any point in the selection process, the bottom section of the array holds the randomly selected numbers, and the upper section holds the numbers yet to be selected.

"The size of these two sections depends on the progress of the selection process, the lower section increasing and the upper section decreasing with each selection. The random-number generator (RND) is set up so that it generates only pointers to entries in the upper section of the array.

"Listing 1 presents a specific case in which random numbers in the range 1 to 30 are generated. In line 30, the numbers from 1 to 30 are loaded into the array in sequence. Although it is not necessary to load the array an any particular order, the randomizing routine (lines 40 to 70) will function properly no matter what the initial sequence.

"This means the array can be loaded in the initialization section of any program and the randomizing routine called as many times as required. Lines 40 through 70 step through the array, moving randomly selected numbers to the bottom.

"For example, after the loop has been executed for I=10, array elements 1 to 9 hold the unselected numbers, and elements 10 to 30 hold the selected num-

Listing 1.

```
10 DEFINT A-Z
20 DIM A(30)
30 FOR I=1 TO 30
:  A(I)=I: NEXT
40 FOR I=30 TO 2 STEP -1
50 X=RND(I)
60 S=A(I): A(I)=A(X)
:  A(X)=S
70 NEXT
80 FOR I=1 TO 30
:  PRINT A(I);: NEXT
```

Listing 2.

```
10 DEFINT A-Z
15 INPUT "ENTER NUMBER
   OF RANDOM NUMBERS";N
20 DIM A(N)
30 FOR I=1 TO N
:  A(I)=I: NEXT
40 FOR I=N TO 2 STEP -1
50 X=RND(I)
60 S=A(I)
:  A(I)=A(X): A(X)=S
70 NEXT
80 FOR I=1 TO N
:  PRINT A(I);: NEXT
```

Listing 3.

```
10 DEFINT A-Z
15 INPUT "ENTER RANGE OF
   NON-REPEATING RANDOM
   NUMBERS";N1,N2
17 N=N2-N1+1
20 DIM A(N)
30 FOR I=1 TO N
:  A(I)=N1-1+I: NEXT
40 FOR I=N TO 2 STEP -1
50 X=RND(I)
60 S=A(I)
:  A(I)=A(X): A(X)=S
70 NEXT
80 FOR I=1 TO N
:  PRINT A(I);: NEXT
```

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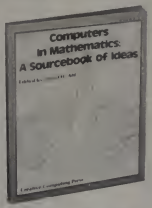

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bers. Line 60 trades the number in element A(I) with the number in A(X).

"Listing 2 is a more general version of the program in which the number of random numbers desired can be specified through an INPUT statement. If a range of numbers beginning with a number other than 1 is required, then the program in Listing 3 will be useful.

"The random nature of the numbers in the array is unaffected by the order in which they are stored; the array can be read from top to bottom by the calling routine even though the randomizing routine stores the random numbers in the reverse order." ■

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Coming Attractions

October

Integrated software packages is the subject of our 16-page special section. Not only do we tell you what to look for in an integrated package, but we rate all the available packages on how well they perform all of their promised functions. A little preview: the differences are staggering—and some just don't measure up.

Also in October, we take an in-depth look at educational software for both school and home. New products, objective reviews, thoughtful articles, and regular columns round out the issue.

November

You have been waiting for this for ten years: the incredible tenth anniversary issue of *Creative Computing*. Here is the history and future of personal computing told by the people who made history and who will make the future. An all-star cast of 50 movers and shakers tells you the story from the inside. People like Scott Adams, Rodnay Zaks, Adam Osborne, Peter McWilliams, Carl Helmers, Don Estridge, George Morrow, Clive Sinclair, Seymour Papert, Gordon Bell, John Kemeny, Bill Godbout, and 38 others.

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December

As we barrel forward, this is the month we pause for a second and look back at 1984 and forward to 1985. We will publish our selections for the ten best computers on the market in ten size/price categories, and we will also make our predictions on what will be coming out in 1985.

Our special section will focus on word processing packages—what to look for and getting the most out of a package. Be with us then!

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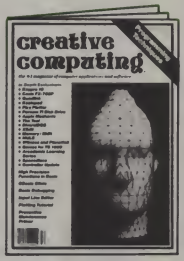

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Radio Shack/Tandy TRS-60	G	R
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Timex Sinclair	I	T
Other (specify)	J	U
None	K	V

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Timex Sinclair	I	T
Other (specify)	J	U
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IBM	F	Q
Radio Shack/Tandy TRS-60	G	R
Texas Instruments	H	S
Timex Sinclair	I	T
Other (specify)	J	U
None	K	V

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